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CONTENTS OF VOLUME XIII.

ARTICLES AND AUTHORS.

PAGE

Apollonius of Tyana. By T. Whittaker 161
Arréat, Lucien. Literary Correspondence (France), 114, 586; Religion in France, 235.
Attention, The Problem of. By O. Kuelpe 38
Biology, The Contrary and the Contradictory in: A Study of Vitalism. By E. G. Spaulding 595
Budge, E. A. Wallis. Neter, the Egyptian Word for God 481
Bumstead, Arthur. The Risen Christ at Damascus 138
Cagliostro—A Study in Charlatanism. By Henry R. Evans 523
Carus, Paul. Theology as a Science, 24; The Problem of Consciousness, 69; The Philosophical Foundations of Mathematics, 273; The Foundations of Geometry, 370, 493.
Chamberlain, Alexander F. Primitive Theories of Knowledge: A Study in Linguistic Psychology 295
Children in Ancient Israel, The Education of. By Carl Heinrich Cornill 1
Christ at Damascus, The Risen. By Arthur Bumstead 138
Consciousness, Notes on. By Paul Robert Shipman 124
Consciousness, The Problem of. By Paul Carus 69
Cornill, Carl Heinrich. The Education of Children in Ancient Israel 1
Danger, The Sense of, and the Fear of Death. By George R. Wilson 352
Death, The Sense of Danger and the Fear of. By George R. Wilson 352
Emch, Arnold. A Strange Application of Mathematical Probabilities 463
Energetics, The Theory of, and Its Philosophical Bearings. By John Grier Hibben 321
Evans, Henry R. Cagliostro—A Study in Charlatanism 523
Geometry Prior to 1850, Sketch of the Origin and Development of. By G. Loria 80, 218
Geometry, The Foundations of. By Paul Carus 370, 493
Gunkel, Hermann. The Religio-Historical Interpretation of the New Testament 398
Hibben, John Grier. The Theory of Energetics and Its Philosophical Bearings 321
Hilbert's *Foundations of Geometry*. By Oswald Veblen 303
Hyslop, James H. Kant's Treatment of Analytic and Synthetic Judgments .. 331
Kant's Treatment of Analytic and Synthetic Judgments. By James H. Hyslop 331
Knowledge, Primitive Theories of: A Study in Linguistic Psychology. By Alexander F. Chamberlain 295

PAGE
Kuelpe, O. The Problem of Attention 38
Literary Correspondence (France). By Lucien Arréat 114, 586
Loria, G. Sketch of the Origin and Development of Geometry Prior to 1850. 80, 218
Mathematical Probabilities, A Strange Application of. By Arnold Emch.... 463
Mathematics, The Philosophical Foundations of. By Paul Carus..... 273
Neter, the Egyptian Word for God. By E. A. Wallis Budge 481
Nichols, John Benjamin. Spencer's Definition of Evolution 136
Papini, Giovanni. Philosophy in Italy 553
Philosophy in Italy. By Giovanni Papini..... 553
Radau, H. The Cosmology of the Sumerians, 103; Semitic Origins, 608.
Religion in France. By Lucien Arréat 235
Schinz, Albert. A New Classification of the Sciences..... 456
Sciences, A New Classification of the. By Albert Schinz..... 456
Scientists out of Place. By P. R. Shipman 617
Semitic Origins. By Hugo Radau..... 608
Shipman, Paul Robert. Notes on Consciousness, 124; Scientists out of Place, 617
Spaulding, E. G. The Contrary and the Contradictory in Biology: A Study of Vitalism..... 595
Spencer's Definition of Evolution. By John Benjamin Nichols 136
Sumerians, The Cosmology of the. By H. Radau..... 103
Testament, The Religio-Historical Interpretation of the New. By Hermann Gunkel 398
Theology as a Science. By Paul Carus 24
Veblen, Oswald. Hilbert's *Foundations of Geometry* 303
Whittaker, T. Apollonius of Tyana..... 161
Wilson, George R. The Sense of Danger and the Fear of Death..... 352

BOOK REVIEWS AND NOTES.

Aikens, H. A. The Principles of Logic 474
Alexander, Hartley Burr. The Problem of Metaphysics and the Meaning of Metaphysical Explanation. An Essay in Definitions..... 155
Anglas, J. Les phénomènes des métamorphoses internes..... 470
Année psychologique..... 469
Aristotelian Society, Proceedings of the. New Series—Vol. II..... 471
Baldwin, J. M. Fragments in Philosophy and Science, 151; Dictionary of Philosophy and Psychology, Vol. II., 319.
Bastian, Adolf. Die Lehre von Denken 476
Binet, Alfred. L'année psychologique..... 469
Black, J. S. and Cheyne, T. K. Encyclopædia Biblica. Vol. IV..... 637
Bolland, C. J. P. J. Hegel's Grundlinien der Philosophie des Rechts 469
Bon, Fred. Die Dogmen der Erkenntnisstheorie..... 475
Brooks, H. Jamyn. The Elements of Mind: Being an Examination Into the Nature of the First Division of the Elementary Substances of Life..... 153
Budge, E. A. Wallis. A History of Egypt from the End of the Neolithic Period to the Death of Cleopatra VII., B. C. 30..... 636
Busse, Ludwig. Geist und Körper, Seele und Leib..... 624
Carus, Paul. The Surd of Metaphysics, 638; Fundamental Problems, 639.

PAGE
Carvallo, M.-E. L'électricité déduite de l'expérience et ramenée au principe des travoux virtuels 158
Cheyne, T. K. and Black, J. S. Encyclopædia Biblica, Vol. IV..... 637
Christiansen, Broder. Erkenntnisstheorie und Psychologie des Erkennens... 479
Cohen, Hermann. Logik der reinen Erkenntniss..... 633
Dannemann, Friedrich. Grundriss einer Geschichte der Naturwissenschaften 319
Dedekind, R. Essays on the Theory of Numbers 314
Delitzsch, Friedrich. Babel and Bible. A Lecture on the Significance of Assyriological Research for Religion..... 310
Deussen, Paul. Die Elemente der Metaphysik..... 467
Dictionary of Philosophy and Psychology, Vol. II..... 319
Doehlemann, Karl. Projective Geometrie 315
Dunan, Charles. Essais de philosophie générale..... 476
Edmunds, A. J. Hymns of Faith (Dharmapada) 312
Eisler, Robert. Studien zur Werththeorie..... 478
Eisler, Rudolf. Nietzsche's Erkenntnisstheorie und Metaphysik..... 468
Encyclopædia Biblica, Vol. IV..... 637
Erdmann, Johann E. Abhandlung über Leib und Seele..... 469
Erratum 160
Goldstein, J. Die empiristische Geschichtsauffassung David Hume's..... 472
Groot, J. J. M. de. Is There Religious Liberty in China?..... 478
Gunkel and Christ's Ṣojourn in Hell for Three Days and a Half..... 479
Haeckel, Ernst. Natürliche Schöpfungs-Geschichte, 158; Die Welträthsel, 639.
Harvard Psychological Studies..... 470
Harvard Summer School of Theology, 1903 479
Haussner, Robert. Darstellende Geometrie..... 315
Hibben, John G. Hegel's Logic..... 468
Hilgenfeld, Adolfus. Ignati Antiocheni et Polycarpi Smyrnæi Epistulæ et Martyria..... 160
Hitchcock, Clara M. The Psychology of Expectation..... 473
Holzmüller, Gustav. Elemente der Stereometrie..... 315
Imbert, A. L'électricité déduite de l'expérience et ramenée au principe des travaux virtuels..... 158
James, William. The Varieties of Religious Experience: A Study in Human Nature..... 147
Junker, Friedrich. Höhere Analysis, 315; Repetitorium und Aufgabensammlung zur Integralrechnung, 315; Repetitorium und Aufgabensammlung zur Differentialrechnung, 315.
Kern, H. Album-Kern 638
Krasan, Franz. Ansichten und Gespräche über die individuelle und spezifische Gestaltung in der Natur..... 635
Kühnemann, Eugen. Schiller's philosophische Schriften und Gedichte..... 472
Laurent, H. Sur les principes fondamentaux de la théorie des nombres et de la géométrie..... 313
Levaditi, G. Le leucocyte et ses granulations..... 470
Lombroso, Cesare. L'homme de génie 478
McCormack, Thomas J. Valediction..... 640
Mach, Ernst. The Science of Mechanics..... 317
Mendelssohn, Maurice. Les phénomènes electriques chez les êtres vivants... 158

PAGE

Münsterberg, Hugo. Harvard Psychological Studies 470
Nissl, Franz. Die Neuronenlehre und ihre Anhänger 466
Plate, Ludwig. Ueber die Bedeutung des Darwin'schen Selectionsprincips und Probleme der Artbildung 634
Popper, Joseph. Phantasien eines Realisten 160
Psychological Index, The, No. 8 156
Radau, Hugo. The Creation-Story of Genesis i 312
Ratzenhofer, G. Die Kritik des Intellects 476
Riehl, Alois. Zur Einführung in die Philosophie der Gegenwart 631
Ritchie, David G. Studies in Political and Social Ethics 154
Salvadori, Guglielmo. L'etica evolutionista 471
Sänger, Ernst. Kant's Lehre vom Glauben 473
Schiele, Friedrich M. Schleiermacher's Monologue 472
Schmidtke, Alfred. Die Evangelien eines alten Unzialcodex 636
Schwartzkopff on Metaphysics 479
Schwartzkopff, Paul. Nietzsche der "Anti-Christ" 467
Sidis, Boris. Psychopathological Researches: Studies in Mental Dissociation 152
Strong, C. A. Why the Mind has a Body 624
Sully, James. An Essay on Laughter 619
Vaschide, N. La logique morbide 477
Verworn, Max. Zeitschrift für allgemeine Physiologie, 157; Die Biogenhypothese, eine kritisch-experimentelle Studie über die Vorgänge in der lebendigen Substanz, 465.
Wallin, J. E. Wallace. Researches on the Rhythm of Speech 156
Ward, Lester F. Pure Sociology 629
Webster's International Dictionary 160
Weismann, August. Vorträge über die Descendenztheorie, gehalten an der Universität zu Freiburg im Breisgau 318
Wettstein, Richard von. Der Neo-Lamarckismus und seine Beziehungen zum Darwinismus 475
Winckler, Hugo. Die babylonische Kultur in ihren Beziehungen zur unsrigen, 311; Die Gesetze Hammurabis, 311.
Workmann, W. P. The Tutorial Arithmetic 474
Wundt, W. Outlines of Psychology, 320; Grundzüge der physiologischen Psychologie, 320.

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THE MONIST

THE EDUCATION OF CHILDREN IN ANCIENT ISRAEL.[1]

FROM the point of view of race psychology there is scarcely a more interesting and more profitable study than the examination of the way in which the various nations educate their children. Since education aims at the development of children into useful and independent members of human society and at giving them whatever they may sometime need in order to fill their place in life and to meet its demands, we can derive from the nature of their system of education perfectly reliable inferences regarding the views of life cherished by the educators and the ideal of man that hovered before them. And so from the beginning special interest is assured for the question, what a people of such importance for mankind as ancient Israel thought about the education of children and how they applied it.

True, what the Old Testament has to say directly about education is very scanty, but the subject itself is enough to spur us to further investigation. For in order to understand rightly and to estimate properly those scant direct utterances about children and education, one must needs have a clear conception of the views of ancient Israel regarding the family and family life, and accordingly we must include also the main points of this latter important subject within the scope of our immediate consideration. In this study I shall restrict myself to the canonical books of the Old Testament,

[1] Translated from Prof. Cornill's MS. by W. H. Carruth.

claiming outside that sphere only the right to be permitted to examine and use Jesus Sirach. For although the Jews never included Jesus Sirach among the canonical books—for reasons which it would lead too far to explain: not indeed from lack of appreciation or because it was considered unworthy of such an honor—yet it belongs in the period of the Old Testament literature: it was composed fully a generation earlier than the book of Daniel, which has been accepted into the canon, and is for us the most classic witness concerning the opinions of Judaism in the year 200 B. C. I shall also take the liberty of referring on occasion to the book of Tobias, which was written about the same time with the book of Esther.

Matrimony and family life are regarded in ancient Israel as unqualifiedly the normal, divinely established and prescribed state. On the other hand, to estimate voluntary abstinence from matrimony as an especial merit, and to ascribe to it a higher degree of divine perfection and even of holiness, was far from the thought of any one in ancient Israel. The saying: "The Israelite who does not take a wife is not to be regarded as a man," is indeed found only in the Talmud, but certainly expresses the views of ancient Israel. "He who has found a wife has found a treasure and won favor from God," and "House and havings are inherited from one's parents, but a loving wife comes from God," are two among the proverbs of Solomon, xviii. 22, xix. 14. Since matrimony is instituted in Paradise by God himself, it assumes a decidedly religious value. "God himself was the witness of the vows between thee and the wife of thy youth," says the prophet Malachi with touching beauty, ii. 14; and the faithless wife is branded, according to Proverbs ii. 17, as one who has "forgotten her vow to the Lord." In the Proverbs of Rabbi Eliezer this thought is expressed very ingeniously and drastically in that fashion so popular with Orientals, a play upon words and letters. Man is in Hebrew אִישׁ (*ish*), while woman is אִשָּׁה (*ishshâh*). Now these two words have two consonants in common א and שׁ, to which there is added in the word for man a י, and in the word for woman a ה; but these two letters taken together יה constitute the shortest form of the most holy name of God which it was forbidden to utter, while the two

common consonants written and read together give the word אש (*ésh*), meaning fire. Now the proverbs of Rabbi Eliezer have it: God himself has placed his name in the midst of the names of man and wife. If they hold fast to him he will himself dwell in the midst of them; but if they lose his most holy name there is left only fire, that is: a marriage where God is a party to the union is heaven on earth; but a marriage where God is not, which is not entered upon in his name and has not the religious basis, is a hell on earth. One can scarcely imagine a more poetical and winning characterisation of such a marriage formed with the blessing of God than that given in the 128th Psalm: "Blessed is every man that feareth the Lord, that walketh in his ways. Thou shalt eat from the labor of thine hands. Happy shalt thou be and it shall be well with thee! Thy wife shall be a fruitful vine in the innermost parts of thine house; thy children like young olive plants round about thy table. Behold, thus shall the man be blest that feareth the Lord!" (Ps. cxxviii. 1–4.)

Let us now consider how such a marriage was brought about in ancient Israel. First of all we have to prove that opportunity was given the young people to get acquainted and to found a union upon personal attraction and mutual love. For even girls moved with freedom in public life. Indeed they were entrusted with all sorts of tasks which necessarily brought them into contact with young men: they had to fetch water, pasture the herds, and guard the vineyards; furthermore it is known that they went out to meet the returning victors in war and welcomed them with dance and song.

As to the circle from which the Israelite selected his life's companion nothing is definitely prescribed. In the older times at least the choice is regarded as unrestricted. Esau brings home to his parents highly unwelcome daughters-in-law from a foreign race, and when Samson proposes to marry a Philistine woman his parents are not exactly pleased with the plan, but they do not regard it as anything wrong and they themselves conduct the suit for the hand of their son's chosen bride when they find that he insists on his desire. But this was not, indeed, the rule: on the contrary, a man

sought his wife by preference in his immediate circle, that is, in his own family. Thus Laban says plainly to his nephew Jacob, when the latter asks for Rachel to wife: "It is better that I give her to thee than to a stranger," Gen. xxix. 19. And when Samson wishes to marry the Philistine woman, his father says to him: "Is there forsooth among the daughters of our kinfolk and in our own family no woman, that thou wilt take the Philistine woman to wife?" (Judges xiv. 3). Cousins of opposite sex seem especially to have been regarded as predestined to betrothal, since the language calls them expressly *lover* and *sweetheart*, דוד and דודה.

This is based upon the old notions which regarded the family distinctly as an ecclesiastical and legal unit, especially in matters of the law of property. From this point of view, therefore, the contraction of the marriage bond was not the establishment of a new family, but the expansion and perpetuation of the family of the father, for which reason it was the rule that the married son remained in the household of his father. If a young man had determined to enter into matrimony and made his choice either at the dictate of his affections or in accordance with the wish of his father, or on some one's recommendation, then his father or some confidential friend sued for the maiden at the hand of her father or her brother: it was not customary for the wooer to conduct his suit in person.

And here we must admit that of the various forms of marriage contract enumerated and classified by ethnographists there existed in ancient Israel only the form of the so-called marriage-sale. If the father of the maiden had given his general consent, it then became necessary to agree on the purchase price which was known by the distinctive name of *mohar*; we have no direct account of the maximum value of this *mohar*, but from a comparison of Deuteronomy xxii. 29 and Exodus xxii. 15 we can infer that in the time of Deuteronomy, that is, toward the close of the kingdom of Judah, the average amount of the *mohar* was 50 shekels of silver. Since we have shekels still preserved, we can at least fix precisely the value of the metal in the same. The shekel of ancient Israel weighed 14.5 gr.: according to the present standard value of silver

14.5 gr. of pure silver would be worth $0.635, and accordingly the normal price for a wife would have been $31.75. And from the moment when the *mohar* was paid down and accepted, the marriage was regarded as legally concluded even when it was not yet in fact accomplished. But it is clearly to be inferred from the very vivid account of Eliezer's suit for the hand of Rebeccah, Genesis xxiv., that the maiden was not bartered like an article of commerce, but that her consent was necessary, and likewise that the father on the other hand could refuse to give his consent to a union. The first mention of the composition of a written marriage contract is found in Tobias vii. 13, and here the circumstance is involved of sending the daughter far away from home into a foreign country.

And legally considered, the wife was the property of her husband; the husband indeed bears the very name of "owner," *ba'al*, and the married woman is called *ish-shâh be'ûlath ba'al*, a woman who has become the property of an owner. But the ultimate reason for this phenomenon we have not to seek in the fact that the woman was regarded as merely a thing, but in olden times the whole house-work and all the domestic industries rested upon the shoulders of the feminine members of the family: a daughter, therefore, was a valuable laboring-factor in the father's house, of which he was deprived, and accordingly it was proper that he should be recompensed and that the family of the bridegroom should pay something in return for the new additional laborer. Accordingly the *mohar* is not much higher than the average price of a slave, which was, according to Exodus xxi. 32, about $19. And thus also we explain the fact that the bridegroom can offer his own personal services instead of the *mohar*: if he is unable to raise the amount of the *mohar*, he becomes the slave of his father-in-law and thus works it out. Thus, as is well known, Jacob, who, as an orphan and a fugitive, was of course unable to offer a *mohar*, served his father-in-law seven years for his daughter. And I must not neglect to note expressly, if we propose to regard the marriage-contract as really a commercial affair, that it was solely the labor of the bride which was the object of purchase: marriage was never a speculation in ancient Israel, and there was no such thing as mar-

riage for money, for the bridegroom had not only the *mohar* to pay, but had also to meet the entire expense of the wedding festivities from his own means. The bride received no money, neither a dowry for her matrimonial estate nor any outlook for the inheritance after the death of the parents. For according to the notions of ancient Israel the woman is never a claimant of rights but only the object of legal claims, and has accordingly no right of inheritance. What is regarded as a matter of course among us, that the widow shall be the heir of her husband and that the estate of the parents shall be divided equally between the sons and the daughters, the Israelite of old would not have understood at all, but would simply have regarded as demented any one who said and claimed such things. Neither the widows nor the daughters received anything, but on the death of the father the estate was divided among his sons, the first-born receiving double the share of the others, but to offset this he had to assume the obligation of caring for and supporting his mother and his sisters.

Hence the Israelitish maiden never had ground for suspecting, when she entered upon matrimony, that she was being married on account of her money, as a perhaps unwelcome appendage to her property, and thus one of the chief causes of unhappy marriages was removed.

But the question will be asked: What if there were no sons, but only daughters, or perhaps no children at all, and only a widow? In such cases, indeed, the widow and the daughters received the estate, but in this case they had not the free disposal of their own hand; the widow had to marry the brother or the nearest elder kinsman of her deceased husband, and the daughter some member of the father's family, so that the property always remained with his line.

Now, if the negotiations had reached a successful termination, so that nothing more stood in the way of the union of the couple, the marriage feast was celebrated. And here again a very surprising but unquestionable fact is to be recorded. Despite the thoroughly religious character of ancient Israel, despite all the recognition of the religious character and the religious foundation of

matrimony, the Old Testament does not contain a hint of any religious consecration of the matrimonial tie, or in modern phraseology, of any ecclesiastical ceremony. And so, at the time of the establishment of the civil statutes when the clerical party especially protested so vigorously against the recognition of civil marriage, while the Catholic Church even to this day refuses to recognise the civil wedding alone as a valid marriage, they have the direct testimony of at least the older portion of the Bible against them. Ancient Israel recognised only the civil marriage, and indeed, strictly speaking, not even this; for the state, so far as we may speak at all of a state within the borders of ancient Israel, paid absolutely no attention to the matrimonial relations of its subjects: the marriage contract was purely a family affair, involving only private rights. Corresponding to the decisive factor from the point of view of private rights that the bride was transferred from the family of her father to that of the bridegroom, the essential part of the marriage ceremony was the fetching and the solemn home-bringing of the bride from the house of her father to that of her future husband. This home-bringing was accompanied by songs and ceremonies of all sorts, but by nothing in the nature of religious rites. The wedding festivities lasted seven days and were at the expense of the bridegroom: in the book of Tobias the wedding celebration at the house of the father-in-law in Ecbatana lasts fourteen days (viii. 18), and after the arrival of the young couple in Nineveh a further celebration of seven days takes place in the house of the father (xi. 17).

To have children was regarded among the ancient Israelites as the greatest good fortune that God can grant to men; this view is probably expressed most concisely in the beautiful saying, "Behold, sons are a gift of God, and children are the reward of grace" (Psalms, cxxvii. 3). On the other hand, childlessness was regarded as a punishment from God and a reproach in the eyes of men. There is no indication in the Old Testament that any sort of symbolical ceremony was necessary on the part of the father whereby he recognised and accepted the new-born child as his own, as we

know to have been the fact among the Romans and the early Germans,—not even in Job iii. 12.

If the wife herself is regarded in law as the property of her husband, the same is still more the case with the children: in law the relation of wife and children to the husband and father is the same as that of slaves, and accordingly the apostle Paul is thinking and speaking in strictly Israelitic spirit when he says in the familiar passage of Galatians (iv. 1): "So long as the heir is a child, he differeth nothing from a bondservant, although he shall one day be the master of all." So the father had the right to sell the children, under the single limitation that it be not to tribal aliens. And so also he had the right to dispose at will of the right of primogeniture, that is, to divert the right of the first-born to one who was not actually the first-born; at least this prerogative is expressly abolished by Deuteronomy xxi. 15–17. Indeed the father had the right of life and death in connection with the child, that is, he could punish the child, and under certain circumstances (Genesis xxxviii. 24) the daughter-in-law, with death, of course in cases prescribed by custom. The way in which the book of Deuteronomy disposes of these paternal rights is very characteristic. We read there (xxi. 18–21): "If a man have a stubborn and rebellious son, who will not obey the voice of his father or the voice of his mother, and will not hearken unto them though they chasten him; then shall his father and his mother lay hold on him, and bring him out unto the gate of his place to the elders of his city, and shall say to them: This our son is stubborn and rebellious, he will not obey our voice, he is a riotous liver and a drunkard. And all the men of the city shall stone him to death; so shalt thou put away evil from the midst of thee; and all hear it and fear." We do not find that the parents first accuse the son, and that afterwards the elders investigate the case and then punish him. No, the parents are both accusers *and* judges: only the execution is withheld from them. At their request and upon their simple notification the inhabitants of the city must execute the penalty of death against the rebellious son. This is a consistent development of paternal authority similar to that which we see executed by Roman law.

The first care of the new-born child seems not, or at least not always, to have been performed by the parents. But as the Greeks had a "paidagogos," that is exactly, a children's guide, a slave who was charged with the special attendance and care of the child, so in ancient Israel we hear of something similar. Here too we are told repeatedly of attendants and nurses, male or female as the case may be, who looked after the care of the child. They carried the child especially in their bosom, that is, in the folds of the garment over the breast and above the girdle, and later probably taught the child to walk. In the case of royal children they probably remained about the young princes as tutors (2 Kings x. 1 ff.). Thus in a familiar passage Moses says to God: "Am I then the mother of this whole people, that thou sayest to me, Bear it in thy bosom, as a nursing father bears his nurseling, into the land which thou hast promised unto their fathers!" (Numbers xi. 12.) And in the book of Isaiah, the future glory of the people of Israel is depicted in the words: "And kings shall be thy nursing-fathers" (xlix. 23). And so, when the son of Jonathan was made lame by the carelessness of his nurse, who, at the news of the defeat in battle at Mount Gilboa, let the five-year-old boy fall in her hasty flight (2 Sam. xlix. 23), as well as in the book of Ruth, which is so full of charming and poetic touches, where we read that Ruth's mother-in-law, Naomi, nursed the son of her daughter and Boaz (iv. 16). And on the subject of learning to walk also we have a picturesque verse. In one of the most touching passages of the book of the prophet Hosea we read: "When Israel was a child, then I loved him and called my son out of Egypt;—Yet I taught Ephraim to go; I took them on my arms" (xi. 1–3).

But in order to enjoy children as a gift of God, they must turn out well and be well trained. "A wise son maketh a glad father, but a foolish son is the heaviness of his mother;" "The father of the righteous may greatly rejoice, and he that hath a wise child may have joy of him;" "He that hath a fool for a son, the same hath sorrow, and the father of a fool hath no joy;" "A foolish son is a grief to his father, and bitterness to her that bare him,"—thus speak the Proverbs of Solomon, x. 1, xxiii. 24, xvii. 21 and 25.

And: "A reproach to a father is an ill-bred son, and such a daughter is to him a great evil"; "Cherish no longing for a multitude of useless children, and take no pleasure in godless sons;—for one is better than a thousand, and better it is to die childless than to have impious sons," says Jesus Sirach, xxii. 3, xvi. 1–3. From such utterances we may fairly conclude that the training of children was regarded as something very important in Israel and that great value was laid upon it. It was expected to begin at a very early age, for "What's bred in youth is done in age" was surely a principle known in ancient Israel as well as elsewhere. "Train the child at the very beginning of his ways, and when he is old he will not depart therefrom," we read in Proverbs, xxii. 6, and "If thou hast children then train them from their infancy," says Jesus Sirach, vii. 23.

Now the first thing that was demanded of the child was absolute respect for its parents. "Honor thy father and thy mother," appears already in the Ten Commandments, and in Leviticus, xix. 3, and xx. 9: "Ye shall fear every man his mother and his father,—for I am the Lord your God;" and "Every one that curseth his father or his mother shall be put to death." The Prophet Malachi says: "A son honoreth his father, and a slave his master" (i. 6). "Be obedient to thy father and despise not thy mother when they have become old;" "A generation that curseth its father and blesseth not its mother,—an eye that mocketh at its father and that despiseth to obey its mother, the ravens by the brook shall pick it out and the young eagles shall eat it," are utterances of Proverbs, xxiii. 22; and xxx. 11 and 17. And on this very point there are some beautiful passages in Jesus Sirach: "Honor thy father with thy whole heart, and never forget what thy mother had to suffer for thee. Forget not that thou owest to them thy life, and how canst thou repay them for what they have done for thee?" (vii. 27–28). "Hear, O children, the commandments of your father, and walk therein, that ye may prosper. For the Lord has made honor of the father a duty of the children, and the commandments of the mother hath he made a law for her sons. He who honoreth his father maketh atonement for sins, and he who honoreth his mother

gathereth a good treasure. He who honoreth his father will have joy of his own children, and when he prays his prayers will be heard. He who esteemeth his father will enjoy long life, and he who obeyeth the Lord will be a comfort to his mother. He who feareth the Lord will honor his father and will serve his parents as though they were rulers. Honor thy father both in word and in deed, that a blessing may come upon thee from them. For the father's blessing buildeth houses for the children, but the curse of the mother destroyeth them. Seek not thy glory in the dishonor of thy father, for his dishonor can never be a glory to thee. For the glory of a man is the honor of his father, and a mother dishonored is a reproach to her children. My son, care for thy father in his age, and grieve him not so long as he liveth. And though he become childish, have consideration for him and despise him not when thou art in thy full strength. For compassion upon thy father will not be forgotten, and instead of the punishment of sins thou buildest thine house. In the day of need thou shalt not be forgotten, and like ice before the sun thy sins shall melt away. He who leaveth his father in need is no better than a blasphemer, and he who grieveth his mother is accursed of God" (iii. 1–16).

One particular sort of respect is especially commended. It seems to have been customary among the ancient Israelites also that the parents withdrew to the old folks' apartments and lived on an allowance. Jesus Sirach gives a most energetic warning against this: "Give not to thy son, thy wife, thy brother or thy friend power over thee so long as thou livest. As long as a breath of life is in thee leave not thy place to another and surrender not thy money to another, lest thou be compelled to beg for it of another. For it is better that the children beg of thee than that thou be compelled to look into the hand of thy son. (xxx. 28–30.)[1] In the same category belong two sayings in Proverbs: "He that spoileth his father and chaseth away his mother, is a son that causeth shame and bringeth reproach" (xix. 26), and "Whoso robbeth his father or his mother, and saith, It is no transgression, the same is among

[1] This is xxxiii. 20–22 in the current German Bible.

the worst criminals" (xxviii. 24). As a matter of course, along with respect for parents the child was trained to all other moral obligations and virtues.

And what sort of pedagogical principles did they have in ancient Israel? That can be told in a single word: the rod. Discipline was indeed very severe,—to our modern humanitarian views absolutely tyrannical. The foremost demand of our theory, that the individuality of the child must be allowed to develop, would have been as incomprehensible to the ancient Israelite as would have been the claim of woman to be an agent of the law. Obedience was the end and all. And since this is not apt to come of itself, it was necessary to resort to drastic measures. When we hear the proverb, "My son, despise not the chastening of the Lord; neither be weary of his reproof; for whom the Lord loveth he reproveth, he chasteneth the son in whom he hath delight" (iii. 11–12), we need not wonder if the earthly father also lays ungentle hands upon his child for its own good. For "he that hath been delicately brought up from childhood will become a servant and end in misery," say Proverbs xxix. 21. (Such is probably the sense of the corrupt and difficult passage.) On this particular point the Book of Proverbs and Jesus Sirach express themselves with all desirable distinctness. "He that spareth the rod hateth his son; but he that loveth him chasteneth him betimes." "Foolishness is bound up in the heart of a child; but the rod of correction shall drive it far from him." "The rod and reproof give wisdom; but a child left to himself causeth shame to his mother." "Correct thy son and he shall give thee rest; yea, he shall give delight unto thy soul" (Proverbs xiii. 24; xxii. 15; xxix. 15, 17). "As is music in the midst of mourning so is a reproof out of place; but chastisements are always proper in discipline" (Jesus Sirach xxii. 6). But here again the most characteristic expression is an extended disquisition in Jesus Sirach: "He who loveth his son letteth him taste the rod continually that he may have pleasure in his conduct thereafter. He who chasteneth his son will have pleasure in him, neither will he be ashamed of him before his friends. He who instructeth his son, giveth offence to his enemy, and will rejoice over

him in the presence of his friends. And if his father die, it is as though he had not died, for he leaveth his like behind him in his place. So long as he liveth he has his pleasure in him, and when he cometh to die he is untroubled. He leaveth behind him an avenger against his enemies, and to his friends one who will remember their kindnesses. But he will spoil his son who takes every blow to heart and who is distressed whenever he weepeth. As an untamed horse is rebellious, so a spoiled son is uncurbed. Treat thy son with delicacy and thou wilt afterwards fear him; play with him and he will afterwards grieve thee. Jest with him and he will cause thee trouble and thou shalt be called to account for his evil deeds. Give him not much freedom in his youth and excuse not his follies. Bend his neck the while he is young and bruise his back while he is small, that he may not become stubborn and disobedient to thee and thou have sorrow because of him. Bring up thy son to labor, lest he give offence and become a disgrace to thee" (xxx. 1–13).

But the strongest, and absolutely shocking for our present feeling, are two sayings from the Book of Proverbs, which for this reason I have saved to the last: "Chasten thy son, seeing there is hope; thou wilt not beat him quite to death" (xix. 18), and "Withhold not correction from the child; for though thou beat him with the rod yet will he not die of it. Thou shalt beat him with the rod and thus deliver his soul from hell" (xxiii. 13-14). For easily conceivable reasons the attempt has been made to eliminate this unmerciful beating from the text by ingenious interpretation of the death as a spiritual death: Chastise thy son, seeing there is hope, lest thou be guilty of his death, inasmuch as he would become the prey of death if he grow up without virtue; or again: Withhold not correction from the child; if thou strike it with the rod it will not die but through severe discipline will become a pious man who will escape the judgment for sin. But this seems to me to be wholly contrary to the sense and spirit of the Book of Proverbs. In fact, that which Luther so aptly translated from Jesus Sirach as "beat his back blue" is literally: "break his ribs." The Oriental is fond of drastic and hyperbolical expressions, which of course

must not be glossed over. That the Old Testament does not regard the father exclusively as the tyrannical administrator of chastisement is sufficiently proven by the familiar passage of Psalms: "Like as a father pitieth his children, so the Lord pitieth them that fear Him" (ciii. 13), and that the rod was only the last resort, and that they could get along very well without it, is sufficiently shown by the Proverb: "A rebuke entereth deeper into one that hath understanding than a hundred stripes into a fool" (xvii. 10). But all the preceding evidence shows us clearly this: That the family according to ancient Israelitic notions was an absolute monarchy, with the father as absolute monarch at the head. Authority and obedience are its foundation-stones.

But while what we have thus far been considering constitutes what may be called moral education, we must now proceed to inquire regarding intellectual education. What did the child have to learn in ancient Israel? Jesus Sirach speaks, xxx. 3, of instruction given to the son: what may have been the topics of this instruction? Here too the Old Testament leaves no room for doubt on the point that the first and most important thing that the father had to teach his son was religion, that religious instruction was the basis and the starting-point of education. "Abraham will command his children and his household after him that they may keep the way of the Lord to do justice and judgment, that the blessing may come upon them" (Gen. xviii. 19). "They shall learn to fear me all the days that they live upon the earth, and that they may also teach it to their children" (Deut. iv. 10). "And these words which I command thee this day, thou shalt take to heart, and thou shalt teach them diligently to thy children" (Deut. vi. 6–7). The father is directed to use every opportunity in order to give his son religious instruction. On the occasion of the feasts especially the opportunity presented itself as a matter of course. "And when at the feast of the Passover thy son shall ask thee, What mean ye by this service? that ye shall say, It is the sacrifice of the Lord's Passover, who passed over the houses of the children of Israel in Egypt, when he smote the Egyptians, and delivered our houses.—And thou shalt tell thy son in that day: Thus did the Lord deal with

me when I came up out of Egypt" (Exod. xii. 26–27, xiii. 8). The same directions are given in connection with the pillars of stone that were set up at Gilgal in memory of the miraculous passage of the Jordan. "When your children shall ask their fathers in time to come, What mean these stones? then ye shall let your children know, saying, Israel came over this Jordan on dry land" (Josh. iv. 21–22).

A classic testimonial of this religious chain of instruction as the center of all domestic training and instruction in Israel is the beginning of the 78th Psalm: "I will proclaim to you the mysteries of old, which we have heard and learned, and what our fathers have told us. Their children did not hide it, but told to the generations to come the great deeds of Jahweh and the wonders that he did for Israel; how he commanded our fathers to instruct their children in the same, that the generation to come might know it, even the children which were yet to be born and these in turn be zealous to tell it to their children, that they might set their trust in God and not forget the mighty deeds of the Lord" (lxxviii. 2–7). It is the first and most essential element of the instruction to train the children to be pious, orthodox and well-grounded Israelites, and to this end is employed first of all instruction in *Bible history*. According to a familiar passage in the "Sayings of the Patriarchs" the instruction in Bible history was to begin in the child's fifth year.

But what was the status of the proper topics of education? Writing, reading, and arithmetic are things which do not impart themselves, and yet they are indispensable in daily life. Now we have definite evidence that reading and writing were widely known in Israel even in the earliest times. Gideon wishes to punish the elders of the city of Succoth for their unpatriotic conduct. "And he caught a young man," so the book of Judges tells us, "of the men of Succoth, and he was compelled to write down for him the chiefs and the elders of the city, seventy and seven men" (viii. 14). This narrative gives us, to be sure, no evidence regarding the time of Gideon, but it does for the time when it was written: it is a part of the oldest historical tradition of Israel, and in this it is taken as a matter of course that the first comer picked up from the field can

write. Or, to take another case, David's captain Joab was by no means what we would call an educated man, but yet he knew how to read and write, as is shown clearly enough in the incident of the all too famous Uriah letter (2 Sam. xi. 14). The same is true in the time of Isaiah, as indicated in the passage, speaking of the condition of Assyria after the divine judgment, "And the remnant of the glory of Assyria shall be small, that a little child might record it" (x. 19), that is, make a list, an inventory of it. And the fact that judicial procedure at the time of this great prophet was documentary, as is the case in the Orient at the present day, is proved by the circumstance that Isaiah characterises unjust judges as "writers that write perverseness" (x. 1). At a peculiarly important crisis of his prophetic activity he is required to take a tablet before witnesses, on which he is to write "with human pencil," that is, in the common cursive hand, the mysterious words "The spoil speedeth, the prey hasteth." And along with this, the oldest monument of Hebrew writing known to us, the Mesa stone of Dibon, erected by a contemporary of the prophet Elijah, exhibits so distinctly and perfectly the characteristics of cursive script as to demonstrate the existence in Israel of a long-practiced art of writing.

But the Old Testament nowhere gives the slightest hint of public schools or of professional teachers. The attempt has been made to find in a very obscure passage of Isaiah, xxviii. 9–13, an allusion to instruction in reading of written characters imparted by a teacher: the defiant and conceited princes of Jerusalem are not willing to be treated like schoolboys by Isaiah, as we would express the idea, but Isaiah has nothing to say of a public school and of methodical instruction in the reading of manuscript imparted there. Hence we must assume, since the art of writing was widely cultivated, that writing, reading, and reckoning were taught in ancient Israel at home and by the father alone, that no school interposed its disturbing and hostile influence between the child and its parental house: nevertheless they thrived excellently without it, and it is easy to imagine how such a close association of children and parents, to whom the parental house was everything, must needs bring to family life a warmth and to the feeling of solidarity a per-

manence, of which we people of modern times have as yet no notion, for the dominant tendency of our time is to reduce the sphere of home and family bit by bit and to make of man nothing but a mere figure in the census reports and the tax rolls.

And now I must give answers to two questions which have perhaps been busying the attention of my readers, and especially the ladies, for some time: What of the mother and what of the daughters? Hitherto only son and father have been spoken of. What position in the education of the children and what influence upon it did Israel ascribe to the mother? And what did they think of the education of girls? First of all we must frankly admit that the mother appears in only a single, and that a very obscure, passage as consciously participating in the education of the children. In the Proverbs of Solomon, there is to be found near the end of the book a little collection of sayings, xxxi. 1–9, with the special heading: The Words of Lemuel, the King of Massa, Which his Mother Taught him. Otherwise the mother is indeed mentioned along with the father, but always with the father and always in the second place. "Listen to the commandment of thy father and despise not the instruction of thy mother" (Prov. i. 8). And the following passage in Proverbs is especially characteristic: "When I was a son unto my father, tender and only beloved in the charge of my mother, then *he* taught me and said unto me" (iv. 3–4). Here, in poetic parallelism, the mother is mentioned first, one may say for propriety's sake, but after that she is utterly ignored: it is the father alone who teaches and educates. That this is nothing accidental is proved by the comparison of two very similar poetical passages, one German, the other Israelitish. We have a eulogy of the virtuous housewife in *The Song of the Bell*, and we also have one in the Proverbs of Solomon, xxxi. 10–31. Now in our Schiller we find directly that—

"She ruleth wisely
Her sphere of home,
The maidens training,
The boys restraining."

In the much longer Biblical eulogy of the virtuous housewife we find no word of this: she is depicted as one who takes excellent care of her husband and his household and keeps everything in the best condition,—but of the children and of her domestic control as mother, not a word! Toward the end, indeed, there is found the very beautiful expression: "She opens her mouth with wisdom and understandeth kindly instruction" (xxxi. 26), but this is put in very general terms and comes in quite incidentally. We meet here an undeniable and very surprising fact. Not, indeed, that the Old Testament is altogether lacking in appreciation of mother love. When, for instance, we read in the First Book of Samuel how Hannah, the mother of the prophet Samuel, visits her son, who is dedicated to the sanctuary, once a year at the time of the harvest festival in the temple at Shiloh, and brings to him a suit of clothing made by herself, it moves our heart to its depths. To express the highest degree of sadness the Psalmist says (xxxv. 14): "Like one who is mourning for his mother." Repeatedly the love of God is compared with the love of a mother, and perhaps nothing more beautiful and touching was ever written than the word of the Prophet: "As a man whom his mother comforteth" (Isaiah lxvi. 13). It is not, "As a son whom his mother comforteth," but "As a *man*." For even a man, proud and conscious of strength, has moments when only a mother can restore and comfort him.

If then, despite this warm appreciation of mother-love, the mother is slighted in comparison with the father in the very realm which our modern notion regards as her peculiar domain, we must assume that it was a conscious purpose in Israel that placed the education absolutely in the hands of the father, and we can, moreover, recognise this purpose elsewhere. It was desired that the training should be serious and severe, not the coddling of a "mother's pet," but a school for life, and this they felt could be better given the child by the father who knew life because he stood in the midst of it.

And certainly it would be very salutary for the present day if fathers devoted themselves more to their children and their children's education, and we must surely hold to this as an ideal re-

quirement. At the same time we will not forget that such conditions are possible only in a patriarchal state which knows nothing of special callings and professional work. It is a matter of course that we cannot demand of a modern father who labors day after day in his office or his counting-room all that was done and could well be done by the father in ancient Israel.

And what of the daughters? First of all I must discuss some passages of Luther's Bible translation where "daughters" are mentioned. In the so-called Sayings of Jacob, Genesis xlix., where Luther translated in the sayings about Joseph, "His daughters go about the management" (of the house?), ("*Seine Töchter treten einher im Regiment*"), this is simply a very queer misunderstanding of what is to be sure a very difficult passage, which is speaking of grapevines and not of daughters. And in the famous parable of the Prophet Nathan regarding the one lamb of the poor man, where it is said, "It did eat of his own morsel and drink of his own cup and slept in his bosom, and was unto him as a daughter" (2 Sam. xii. 3), this gives us the impression that it is intended to express a greater degree of tenderness than if it had said, "It was unto him as a son." But the lamb is in Hebrew of the feminine gender: the passage is strictly: "She was unto him," so that there was nothing to do but add, "a daughter." For our sense of language the only correct translation would be, "And it was unto him as a child." And when Luther translates in the eulogy of the virtuous woman, Proverbs xxxi. 29, "Many daughters bring wealth," many a Bible reader with a wealth of daughters may have shaken his head incredulously over the passage and thought to himself: that relentless realist Jesus Sirach certainly knew life better. For in an exceedingly drastic disquisition, much too drastic for our sensibilities, he shows that a daughter is a very questionable treasure which keeps the poor father awake of nights with anxiety (xlii. 9–14). Now the passage in question in Proverbs of the many daughters who bring wealth, should read, "There are indeed many excellent maidens."

As to the education of daughters, there is in the entire Old Testament only a single utterance, and that in Jesus Sirach, but a

very striking one: "If thou hast daughters, train them to walk virtuously, and regard them not too tenderly. If thou dispose of a daughter in marriage, thou hast done a good work, but give her to a man of understanding" (vii. 24–25[1]). That is all that we have on the subject! Of course the religious instruction was given to the daughters also, yet in addition they received instruction in domestic work, which of course was taught by the mother.

But as for education in the special sense of the word, viz., writing, reading, and arithmetic, we have neither direct nor indirect information on the subject. For even though Queen Jezebel in the familiar account of Naboth writes a letter to the elders of Jesreel and seals it with the seal of King Ahab (1 Kings xxi. 9), we cannot conclude from this alone that girls in general could read and write. And we have a classic illustration of the view of the later Orient on this subject. An exceedingly popular variety of literature is what is known as the literature of apothegms, in which are collected maxims, opinions, sententious sayings of famous men, chiefly Greek philosophers. These apothegms are found throughout the entire Orient in translations and the greatest variety of versions so that we may fairly regard their contents as typical. And among these apothegms the following story is told of the philosopher Diogenes: Seeing one day some one teaching a girl to write, he said, They are dipping her arrows in poison! That means a vigorous and thoroughgoing hostility to all feminine education, and this the Oriental clearly regarded as wise and correct. For the Oriental has never been able to rise to the recognition of the equal rights of man and woman, or even of an equal humanity in them. And in this respect the Israelite is Oriental. In the Talmud we find three times the saying: "Well for him whose children are boys; woe to him whose children are girls!" In the Old Testament there is indeed nothing like this directly expressed, but without doubt this is what the Israelite of old thought.

The Koran also furnishes instructive material on this point. The heathen Arabs worshipped chiefly three feminine divinities,

[1] In Luther's Bible verses 26–27.

who are called daughters of Allah; for they were fond of conceiving all higher powers as feminine. Mohammed attacks this habit of thought with the following drastic *argumentum ad hominem:* "Is it not true that ye wish to have sons; and should God have daughters? And if the birth of a daughter is announced to one of you, then his face is o'erclouded with trouble, and he suppresses his desperation only with difficulty, and hesitates to appear in public because of the bad news that has come to him, and he is in doubt whether to bring her up to his own disgrace or rather to bury her in the earth!" (Sûrah 16, verses 59–61). The exposure and murder of newly-born girl children is of course a widespread custom, of which the prophet Ezekiel must have known, for in the famous sixteenth chapter of his book he describes Jerusalem as a new-born, castaway Bedouin girl, that lies moaning and weltering in its own blood by the wayside, where God finds it and takes it up, and then tends lovingly and rears to maturity. Not that Ezekiel meant to ascribe such an abominable practice to the ancient Israelites, for he says too expressly, "Thy father was an Amorite and thy mother a Hittite."

But in the passage cited, Mohammed speaks of burying in the earth, and on this point our information about the ancient Arabs furnishes us a horrible illustration, for there was among them a custom which is even not lacking in a certain grim humor and probably presents in its unqualified brutality the most peculiar of all solutions of the woman question. If casting away in infancy did not accomplish the desired result, and if there were still too many girls in the community, then the fathers took the unmarried daughters, decked them as brides and buried them alive. That is the Oriental conception of the inferiority of women, who were really regarded merely as a necessary evil. And in this point Israel did not wholly break down the Oriental barrier, and indeed it did not actually accept the complete religious equality of men and women.

Attention has often been called to the fact that in the priestly regulations of Leviticus the priest is forbidden to defile himself by contact with the corpse of his wife; that is, to perform the funeral lament for her; at least, in the evidently very accurate list of the

persons for whom he may perform this service the wife is lacking (Lev. xxi. 2–3). Judaism also regarded the man as the sole bearer of religious worship. The main space of the synagogue is used exclusively by men, while the women, concealed in the balconies, are spectators rather than participants in the worship. The obligation which rested upon every mature male Israelite of reciting twice a day the so-called *schema*, the elemental confession of Judaism is expressly designated as not valid for women in a Mishnah of the treatise *Berachoth*, and since the man thanks God expressly in the daily prayer that he was created a man, of course man and wife cannot even pray in concert. Hence we need no longer be surprised if we find in the Old Testament nothing of the education of girls.

Let me sum up. The ancient Israelitish family was an absolute monarchy based upon obedience, and the father the absolute monarch in it. The education of the children also lies entirely in his hands. Training is strict, even harsh, the fundamental element of it being religion and its principal aim the development of a religious personality. Even the school instruction was given at home and by the father; whether the daughters received any share of it we do not know.

These views precisely reverse everything that we regard as natural and a matter of course. What then shall we think of them? They are certainly not the final word on the subject; the gospel of the freedom of the children of God, in which there is no distinction of male and female, is higher. But let us not on that account despise them; for they served their purpose, they stood the fiery test in a very literal sense. If Israel has successfully outlived all its persecutions and all the blows of fate, this has been possible only because every individual household constituted a compact unit, which might be destroyed but not broken up. And although much about this institution, even perhaps the whole of it, fail to secure our approval, yet I would like to call attention to one very cogent fact. Our kindred nation in distant South Africa, whose heroic struggle for its freedom and existence has for nearly three years kept the whole world that has any heart in a fever of hopeless hope, is a

shining illustration of the Old Testament sort of education. The Boers, with their childlike trust in God and their naïve belief in the Bible, with their patriarchal conditions and their old-fashioned institutions, are in the very depths of their nature an Old Testament people. And what applies to the Boers holds good for Israel. The Old Testament sort of education trained men and heroes, perhaps not always lovable and sympathetic, but whole men, armed for the battle of life and steeled for martyrdom, greater heroes perhaps in suffering and enduring than in action. An education that can show such results and upon which the blessing of God rested evidently for so many thousand years, may certainly command our admiration.

Carl Heinrich Cornill.

Breslau, Christmas, 1901.

THEOLOGY AS A SCIENCE.

PART II.

THE HAECKEL-LOOFS CONTROVERSY.

THEOLOGY has recently become a science. The idea of God is being purified on a philosophical basis and is fast becoming a term that will no longer give difficulty to the scientist, while the Bible is being investigated with a critical earnestness with which no other book has ever been studied. At the same time, comparative religion is giving us a better comprehension of our own faith and religious sentiments.

A century ago great disasters, such as hurricanes, volcanic eruptions, earthquakes, etc., gave rise to theological discussions in which the representatives of all creeds endeavored to show that there was no conflict between God's omnipotence and omniscience on the one hand and his omnibenevolence on the other. The young Goethe was still overwhelmed with the problem of the earthquake of Lisbon, as can be seen in his autobiography, and he found no satisfactory solution of it in the traditional conception of God. In our present age the latest outburst of Mount Pelée has wiped many thousands of people out of existence in the most horrible manner by suffocating them with obnoxious gases and covering them with a hail of fire. The tragedy on Martinique with a criminal as its sole survivor must have been more horrible than the catastrophe of Pompeii and Herculaneum, and worse than the earthquake of Lisbon! Yet no theological discussions were raised either in the papers or in the pulpit. No questions were asked in public as to the goodness of God. There was no excitement about it of a reli-

gious nature, save the sympathy expressed by sending help and taking care of the unfortunates that were still alive in the ruined island.

The true reason of this change must be sought in the fact that to the thinking part of mankind the problem has been solved. There are some left who do not as yet know of the new conception of God and still cling to their anthropomorphic views, but even they have their misgivings about it, and so keep quiet. Even they know that the laws of nature are irrefragable and that the old notions of providence, being no longer tenable, must be replaced by a new doctrine which holds that providence is immanent in man and that man must work out his own salvation.

There are to-day more avowed atheists than ever, and the theists are divided among themselves. Some believe in a personal God who has theoretically all the power of an autocratic ruler, but in their inmost hearts they concede that he has virtually abdicated in favor of law and so can no longer be held accountable for the various accidents that befall mortals. Others have more or less identified God and law and are thus approaching every one in his own way a scientifically tenable conception of God.

A few years ago when a storm happened to sweep over the Atlantic threatening to sink an ocean liner on which the Rev. Mr. Moody had sailed, a frivolous reporter interviewed the pious preacher, the captain, and many of the passengers as to their belief in the efficacy of the revivalist's prayer on that occasion. Moody refused to answer the question, for even with his child-like faith he saw that however he might represent his views there was little chance of making converts, and the reader could see a sort of grim humor in the report of his few remarks, which were published without invidious comments and with strict impartiality.

It is natural that in the excitement of danger people of Mr. Moody's education and disposition should implore God's mercy, but we no longer blame the captain if he has no confidence in the efficacy of prayer. Whatever the captain believes, we expect him to keep his head clear and to take the right measures to save his ship. Prayer is recommendable if it has that effect upon his mind.

If prayer were truly a reliable method of commanding the wind and the seas, navigation companies would not fail to engage men that could pray and send them out on dangerous sea voyages. But the old belief in this external and pagan conception of the efficacy of prayer has become a mere student's joke even in the good university of Oberlin, where it was said that when a certain celebrated divine prayed it sprinkled, but that when old Dr. Finney, the pious and militant theological president prayed, it *poured.*

The Pelée disaster was too terrible for frivolous comments, and so all religious discussions were hushed by the seriousness of the occasion.

Only later did the papers publish a few extravagant utterances, from which I select one which comes from the island of Martinique itself.[1] Père Marcy, the Curé of a church at Morne Rouge, denounced the inhabitants of St. Pierre for Satanism, renewing the old exploded charges of Leo Tàxill and the mythical Diana Vaughan, exclaiming with a shudder: "You have no conception of what went on in that wicked city! The Satanists and their black masses, the terrible people who worshipped the devil and made their horrible offerings to him, were not the only ones whom God punished. . . . Poor souls! They had not even time to repent of their sins."

Such views are mere survivals and are considered curiosa of antiquated bigotry and ignorance.

This change of conduct indicates a radical change in the religious attitude of the world,—a change which from the old standpoint may be characterised as a drifting toward infidelity, but which is simply the progress of a scientific conception of the world. Science has added to our knowledge and is just about to modify our religious faith. We cease to be children and approach the age of maturity. We put away childish things and grow in comprehension. There are many, perhaps, who are not yet clear as to what the new God conception is, but most of them instinc-

[1] See the St. Louis *Republic* for Sunday, July 13.

tively feel the change, and their thinking and doing is influenced by it without their knowing it.

The transformation of the old theism into the new conception of God may be fairly compared to the progress of science from alchemy to chemistry or from astrology to astronomy, and so we have proposed calling the new theology THEONOMY, as being a genuine science in contrast to the old theology which was based upon erratic notions, guesses, and prophetic dreams.[1]

The errors of the old theology are like the heads of the hydra; when lopped off they grow again in greater numbers. Accordingly it is dangerous to fight them in open battle. There are some theologians who still believe in the old views; they distrust the progress of science and continue to hold back, but their ranks are beginning to grow thin. Others seek refuge in agnosticism. A few take their cross upon them and tell the straight truth. They may be honest, but they are not wise. So far a certain percentage of them has been tried for heresy, found guilty, and dismissed. Most of the theologians who know the truth and have found the solution, break it to the world gently, confining their efforts to the education of a new generation that will be better prepared for the problems of the present age and will no longer shrink from recognising the rights of science. These employ methods that promise success, but they have developed a new language and new modes of speech which none but the initiate understand in their full significance. They speak the truth, but they express themselves in terms which do not state but merely involve the result; or whenever results are given direct, their negative side, which discredits the old theology, is only indicated, while the positive aspect is emphasised with great energy.

Among these theologians there are plodding investigators, men of deep conviction, who have had in their own hearts to overthrow the idol which they worshipped. They know what a hard struggle it is to break away from the old traditional interpretation of religion and the child-like trust in the letter. And, now, in for-

[1] See *The Monist*, Vol. XII., No. 4, p. 561.

mulating their new views, they stop to consider the sentiments of their brethren who have not yet reached the same stage, and from sheer charity couch their statements in guarded terms and express themselves in words that will give no offence to those who are still babes and should be fed with milk only.

* * *

Charity in theological discussions is a new feature which corresponds to politeness in the realm of the other sciences. The old theology, like astrology, is distinguished by a certain vigor of expression, which rarely hesitates to show its firmness of faith in denouncing all other views as heretical.

Swearing in society is regarded as improper, but it was the style in the old theology. And the damnation of heretics is still the favorite method of settling theological disputes in the most conservative and venerable Churches. Tolstoi has had his experience of it, and Protestants even to-day are officially cursed once a year by Rome, while the Protestant confessions of faith still contain denunciations of the Pope as Antichrist.

There is no need of our denouncing, ridiculing, or vituperating the old method of settling disputes in theology, and we make reference to it without any animosity, simply characterising it as typical of a certain age of our religious development. In its time it was as natural to the Church as are childish pranks to children. The churches have outgrown it to a great extent, and will outgrow it more when, on their approach to maturity, following the prediction of St. Paul, they will put away childish things.

The fanaticism of the old Church indicates the fervor of the religious sentiment, and although the consequences are very sad when we consider the fagots of the inquisition, we need not dwell on the dark side now but may rejoice that the times have changed. We must understand, however, that the approach of science is the abolition of brutality in enforcing the truth of a proposition. The man who can prove his views by rational arguments never uses threats. Accordingly vigorous terms in upholding a proposition appear in inverse ratio to its being supported by scientific argu-

ment. Thus the more a science has reached the stage of maturity, the politer are its representatives in their discussions of mooted subjects. Mathematicians are in the habit of simply pointing out the mistakes of their colleagues. They never revile one another, for arguments are sufficient, and so they can afford to behave like gentlemen. In the measure that there are no arguments forthcoming, scientists feel constrained to make up for the deficiency by vigorous expressions denouncing as an ignoramus any one who ventures to differ from them. Thus even mathematicians, in trespassing upon the domain of metaphysics in building its metageometrical air-castles, occasionally assume the theological style. Discussions of the natural sciences, when their devotees make raids into the unknown territory of hypothesis and theory, are by no means free from personalities and invectives, still they are moderate when compared with the controversies of philosophers with their denunciations and self-glorifications. Think of the self-sufficiency of the Hegelians in Germany and witness the tirades of Schopenhauer! He had no arguments to offer; so he hurled at his *confrères* who at that time were in possession of almost all the professional chairs, the thunder of his displeasure. In the measure that philosophy becomes a science, its representatives cease to use epithets.

The climax of vigor in the assertion of a position without argument is reached in the domain of religious dogma; and we will not think the worse of the theological scholars of past ages when we consider that in their dearth of rational argument invectives and interdicts, excommunications and heresy trials, and sometimes even fire and sword, were the only weapons that could be had. If we tolerate Schopenhauer, should we not also have some consideration for the popes who are surrounded by mediæval traditions? Their thunderbolts are blunted, and the days of massacres of St. Bartholomew are past. We need not forget, but we can forgive; for we have learned to appreciate the psychology of fanaticism.

The time has come when theology itself attains to maturity. It is fast becoming a science; and in the measure that it becomes a science theologians will cease to excommunicate heretics and intro-

duce a new spirit into their discussions which is less vigorous but more polite, more considerate, more charitable.

It may appear that the abolition of vigorous terms in the domain of theology will make of it a namby-pamby science without character. But such is not the case. Argument, the new weapon, is as much more formidable than the fagot in destroying errors and in eradicating heresy, as the rifle is superior to the ancient crossbow and the cannon to the club of a savage. It is mere euphemism when we speak of the old methods of theological discussion as "rigorous," for we are fully aware of the power that scientific argument carries. Though modern scientific discussions are couched in polite language they are incomparably more formidable than the weapons of modern warfare, and will brook no resistance. Science gives every one, every institution, every faith, every man in his station a chance to conform to its revelation, but it will slowly yet surely crush anything that persists in opposing it.

* * *

In speaking of theology as a science, we ought not to pass over in silence an incident which made a great stir in the scientific world, and which, though of a personal nature, is of general interest as characterising the period of transition—viz., the case of Loofs *versus* Haeckel. The contrast is overdrawn and the literature on the subject distorts the picture of the situation, but it will for this reason serve all the better to point out the true relation between natural science and theology.

Professor Haeckel is a naturalist, not a theologian, not a philosopher, not a historian. But being a man of deep emotions, he is enthusiastic in whatever he does, he is zealous in whatever cause he espouses, and would be called intensely religious were not his religious ideal opposed to old established religious institutions. It is but to be expected of a man of Haeckel's type that he should have artistic talents; he paints and has as keen a sense for beauty as for poetry. In natural science he rises mountain high above the average naturalist, and his peculiar field is an almost prophetic comprehension of the significance of the facts which mark the pro-

cess of life in its successive phases. It is not an accident that his nomenclature, words like "ontogenetic" and "phylogenetic" and a host of other terms, has been universally accepted by naturalists, but it must be regarded as an evidence of Haeckel's genius for finding the characteristic feature that needs determination and for describing it clearly and unmistakably by a single word. Haeckel's greatness is due to his clearness, and his fame is founded on his penetration in tracing the simple laws that rule complicated phenomena.

This sense for the recognition of the simple which Haeckel manifests, is at bottom a moral quality. He who knows Haeckel personally will gladly agree with me that he is without guile and as simple as a child. He makes no pretensions; he does not bluster or make a show; he neither seeks nor makes complications. He is direct in all he does, and in all he thinks, and in all he writes. This directness is peculiarly his when he observes nature; this directness appears in the style of his books, and this directness makes him openly blunder when he is mistaken; but this directness is simply a child's love of truth. Though Haeckel does not call himself a Christian, he is truly possessed of that child-like spirit which Christ declares is indispensable for the attainment of the Kingdom of God.

Professor Haeckel has written a book entitled *The World-Riddle*, which was a great financial success, but it became the butt of all his adversaries, theologians, Protestants and Roman Catholics, dualists of every stripe, and also philosophers and their ilk. Much of this criticism is perfectly true and may be granted in advance. Many most essential tenets in Haeckel's philosophy are thereby rendered irrelevant or antiquated, but that proves nothing against his peculiar significance in modern thought as a prophet in the field of natural science; it proves merely (as stated above) that he is not a theologian, not a historian, not a professional philosopher.

Although I consider myself a personal friend of Professor Haeckel, I by no means accept his formulation of the Monistic conception. I have had discussions with him in both *The Open Court*

and *The Monist*.[1] He made his statements and I my counter-statements, but he has always regarded the differences as trivial and purely verbal. Instead of discussing the differences, he simply wrote in a private letter: "We mean the same." Now that may be perfectly true, simply because Haeckel deems it necessary to negate certain theological claims, while I endeavor to point out the religious significance of the facts of life. He sees the latter as well as I, and I agree with his position as regards the former; but he slurs over the latter, and I deem the former antiquated. In the field of science there is nothing more important than the religious significance of scientific truth; and on the other hand, in the realm of Church life nothing is more important than the *résumé* of scientific results that affect the traditional religious belief. Hence it is natural that Professor Haeckel's religious views should have caused quite a stir in the world. He has been attacked not only by theologians, but also by philosophers. At present we are interested in the theological issue of Haeckel's position, and will therefore limit ourselves to a few comments upon the formidable onslaught on Haeckel's book *The World-Riddle*, made by Friedrich Loofs, Professor of Church History in Halle.

Professor Haeckel's *World-Riddle* is less scientific than religious, and considering his position in religion and his negative attitude in theology, the book is strong in the criticism of antiquated views and wanting in building up a new theology that would accord with natural science; and this weak point has been discovered by many theologians, philosophers, and historians, and the result has been a general attack upon our famous friend, executed with remarkable unanimity as if by general order. Here was a chance to take the scalp of a famous naturalist, and many a puny knight ventured forth to meet the giant and have a fling at him, in the hope of becoming a second David.

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[1] See for instance "Monism and Mechanicalism, Comments upon Prof. Ernst Haeckel's Position," in *The Monist*, Vol. II., pp. 438–442; "Professor Haeckel's Monism," *ibid.*, Vol. II., pp. 598–600; "Professor Haeckel's Panpsychism," *ibid.*, Vol. III., pp. 234–242; "Professor Haeckel's Monism and the Ideas of God and Immortality," in *The Open Court*, Vol. V., No. 212, pp. 2957–2958.

Professor Loofs is one of these would-be Davids. He put on the royal armor of science, but it proved too heavy for him, so he preferred the sling of abuse and attacked Haeckel in the vigorous style of ancient theology by calling him names.

Now, we know little about Professor Loofs's accomplishments. Upon the whole, he seems to be a fairly well-established representative of modern theology, though he is not a star of the first magnitude. He is a scholar and is apparently imbued with the spirit of science. But he does not conceal the irritation he feels when contemplating the recognition which is accorded to the natural sciences, and he chafes at the thought that the public at large as yet know nothing of the latest developments in theology. Even men of fame know nothing of it, and the time seems to have come for a doughty knight of divinity to have a tilt with one of the naturalists and prove the valor of the theologian in the domain of science.

Now, Haeckel claims that the miracle of the immaculate conception is untenable, and venturing in a footnote upon the historical field incidentally makes the mistake of treating an old Jewish insinuation, that Jesus was of illegitimate birth, as a historical document of credence. Professor Loofs did not let the opportunity slip. He addressed Haeckel in a private letter first sarcastically but politely, then in a public letter in most in sulting terms, with the outspoken hope that Haeckel would sue him for abuse. A law suit of that kind would have engaged public attention, and Professor Loofs's name would have appeared in all newspapers. Haeckel, however, did not gratify Loofs's wish but referred him to his authority, Saladin.

Now, Saladin is the pseudonym of W. Stuart Ross, a Scotchman, who began his career as a student of theology but turned unbeliever and is now editor of the *Agnostic Journal* and one of the most noted freethinkers in London. Haeckel, who is quite ingenuous in matters theological, spoke of Saladin as "a prominent English theologian," and so furnished more grist for the mill of Professor Loofs.

Professor Haeckel can scarcely have read Loofs's expositions, for he (not being in the habit of writing between the lines) is still

less accustomed to read between the lines, yet this is an art which has attained a high development in modern theology. Probably Haeckel did not even read Professor Loofs's letters, and so, assuming that his critic believes in the supernatural conception, refuses to enter into a controversy with him. Here Loofs finds another weak point. He accuses Haeckel of dishonesty, for Loofs insists that Haeckel's negligence is intentional.

In our opinion there is no question but Haeckel's oversight is due to carelessness, and not to dishonest misinterpretation, for what a chance did Haeckel miss in not requesting Loofs to state frankly and in unequivocal terms whether or not he believed in the natural birth of Jesus!

Professor Loofs (another Herostratus) was bent on acquiring notoriety, and so he took opportunity by the forelock and again rushed into print, this time in a pamphlet under the title *Anti-Haeckel*, in which he triumphantly displayed the scalp of the famous naturalist.

The situation is humorous and would afford good material for the cartoonists of *Puck* and *Life*; but we will forbear entering into details and discuss only such points as possess a significance beyond themselves.

The soil on which our David met his giant adversary (viz., ancient Jewish traditions) is slippery ground and all but inaccessible to common mortals. Its topography is known only to a few rabbis of Poland and Germany who have been reared from babyhood on the milk of Talmudic lore. It is a matter of course that Professor Haeckel is not at home here and to take him to task for being ignorant as to the literary significance of a reference to the *Sepher Toledoth* is as much justified as if Haeckel found a flaw in Professor Loofs's knowledge of some obscure detail of the natural sciences, say on the subject of parthenogenesis which in certain families of the lower species is not a miracle but an established fact. But unfortunately Professor Loofs, in spite of his theological education, failed to prove his point and gave evidence only of his ignorance in this special branch of learning. Dr. Erich Bischoff, the editor of the *Christliche Welt* in which Loofs published his open letter to

Haeckel, proves that Loofs's counter-proposition is untenable and that even his statement concerning the synodicon as to the established canonicity of the four gospels at the Council of Nicæa cannot be relied upon. But that is incidental and we do not intend to enter into details, though it ought to have taught Loofs charity toward others.

One point is of special importance; it is this: On close inspection it appears that both parties agree much better than Professor Haeckel is aware of. Professor Loofs seems to believe as little as Professor Haeckel in the virgin birth of Jesus, but while the latter makes his statement in the directest possible way, saying that he being a natural philosopher does not believe in miracles, Professor Loofs is more circumscript and makes no definite statement. The conclusion at which he arrives is written between the lines.

Professor Loofs insists that he attacks Haeckel on account of "his vigorous hatred of Christianity and his lack of appreciation of Christian faith and morality;" he speaks of his "arrogant ignorance" (*anmassliche Unwissenheit*), but expressly denies that the historicity of Christ's virgin birth is the issue of the controversy. As to the latter, Loofs points out that "there was an ancient tradition in Jewish-Christian circles according to which Jesus was regarded as the son of Joseph";....and "it is not an arbitrary proposition to represent Math. i. 18 ff. and Luke ii. 1 ff. as belonging to later strata of Biblical tradition...." However, dogmatic arguments in favor of the Parthenogenesis cannot stand...."There is no reason to understand why a natural birth in the conception should be different from a natural growth," etc., etc.

I have no inclination to argue with Professor Loofs; he might write me a letter similar to that which he wrote to Haeckel. So simply state a few of his arguments to show the logic of his argumentation. Dr. Bischoff, who seems to possess the tact to find the proper word at the right time, adds that Mary's psychical virginity is more significant by far than the miracle of a supernatural conception. But we might suggest to Professor Loofs that the literary arguments of the Church historian which are supererogatory

to scientists like Haeckel, have no weight with people who accept miracles, and must appear flimsy to a staunch believer.

* * *

The case Loofs *versus* Haeckel is a spectacular side-show, which is as interesting as a burlesque written in travesty of a serious drama. While it discloses foibles in both combatants, it indicates that the times have changed. There is now a theology that has become a science, and natural science has become one of her most powerful allies.

We know now that all truth is divine and God reveals himself in natural science as well as in history. The most significant lessons for religious purposes are the facts of man's life; his sorrows and temptations, his bereavements and his final destiny in death. His spiritual growth is recorded in the development of the race and has found classical expression in the sacred books of the several religions. The duty devolves upon us to study these documents of man's religious life, to collate and compare them and thus understand their significance in the religious evolution of mankind. A literal acceptance of the Bible and of the dogmas in the symbolical books is as pagan as was the ancient belief in Greek mythology. A genuine Christianity and a scientific theology (viz., theonomy) became possible only through the overthrow of the paganism that still clings to the traditional interpretation of religion. So far the new theology has plodded on in modest obscurity, but the time has come when what scholars whisper into each other's ears will be preached from the housetops. It is an open secret, generally recognised though little talked about, that the new theology exists and is in a quiet way working out a most important reformation in our religious life, and this reformation is mainly concerned with the intellectual side of religion and insists on scientific honesty.

Do not blame the new theology for its reluctance in speaking out boldly and bluntly, for there are many things that, though true, would, under certain conditions, if uttered brusquely, be positively injurious, and indeed, if expressed without propriety, even wrong and false. We cannot recommend Professor Loofs's methods. In his theological articles he uses the language of the new theology,

speaking by indirection, but in his controversy he follows the vigorous methods of the old theology, heaping abuse upon the head of his adversary. While his example ought not to be followed, we appreciate highly the tact of the genuine theologian.

There is no need of either letting truth ostentatiously go naked or of hiding her form in the drapery of hypocrisy. Discretion is her most becoming garment.

If Professor Haeckel had known that his theological adversary absolutely disclaimed defending the supernatural birth of Jesus, nay more, that on close inspection he was even guilty of not believing it himself, and that his notion of miracles was diluted by philosophical considerations, he would have been bewildered, for he takes the supernatural birth of Jesus to be the issue of the controversy. If Haeckel had been aware of the fact that Professor Loofs censured him merely for a lack of judgment as to the historical unreliability of certain references in the Talmud, made in an incidental footnote, he would have exclaimed: *Pourquoi tant de bruit pour une omelette?*

EDITOR.

THE PROBLEM OF ATTENTION.[1]

I.

I AM looking at the flowered pattern of the paper on the wall in front of me. I see the intertwining of the stems, and the outline of flowers and leaves; I am conscious of the differences in color and brightness within the pattern itself and between it and the uniform background. All these details come out with perfect clearness at the spot upon which my gaze is directed. It is true that this spot is of no great size; its diameter, as I sit at a distance of one meter from the wall, is only some six centimeters. Around this spot I notice that the flowered pattern loses in clearness, at first slowly, then more and more quickly, until I reach the limit of my field of vision, and cannot make out any pattern whatsoever. If I did not know that the whole wall is covered with the same paper, I should suppose that the paper-hanger had chosen less and less pronounced patterns, the farther he moved from the point upon which my eyes are fixed, until finally all pattern and color were lost in an indifferent gray.—In this description I have, of course, assumed that the eyes do not move.

I am short-sighted, so that I cannot see the pattern clearly unless I wear glasses. If I take them off, the part of the pattern directly before me looks like the part of the wall that I saw just now round about the point of regard. The contours are indistinct and the details are blurred. The books, placed a little further below, have their titles printed on the covers in large black letters. I am now unable to read them, and my eye must approach consid-

[1] Translated by Professor E. B. Titchener, Cornell University.

erably nearer to recognise the words without glasses. The two differences of distinctness, hitherto mentioned, are known to depend on the peripheral organisation, i. e., on the mechanism of the sense-organ, the eye. The retina, on which the objects of the external world must project their images in order to be perceived, has at its centre a depression known as the point of clearest vision. The light-perceiving elements are here set most closely together, and thus make possible the most exact representation of the outer-world. Beyond this depression there are interstices between the elements; they increase with the distance from it, and we lose accordingly first the finer and then the coarser differences in the form of the retinal images; till at last all details disappear in a confused general impression. And again, the rays of light proceeding from a luminous point in the outside world cannot be reunited at a single point on the retina, unless the lens of the eye have the appropriate focal distance, which can be varied within certain limits by what is called the mechanism of accommodation. Beyond these limits, which for the short-sighted eye are extremely narrow, the images of luminous points in external space are not themselves points but circles, "dispersion circles" of greater or less diameter. Consequently, objects which lie at a distance for which accommodation is impossible are seen hazily and indistinctly.

But there may be still other reasons for the indistinctness of the pattern of my wall paper. If, e. g., I am blowing a cloud of smoke from my cigar, and the smoke floats up between my eye and the wall, I see the pattern dimly as if through a veil. So, on a foggy day, I may adjust my eyes as accurately as may be; but I shall not make out a single detail of the mountains among which I stand. I can hardly distinguish the line of division between them and the horizon. The production of this sort of indistinctness, which evidently depends upon objective conditions, is a problem in physics. It lies altogether beyond my power or volition. The production of the other two forms of indistinctness, on the contrary, is a problem in physiology. The differences in visual perception are conditioned upon certain peculiarities of the sense organ,—upon a change in the structure of the retina, and upon the

range of accommodation. But, here as before, our mind is not directly responsible for them. Their conditions are to be sought, not in any attitude of mind, but in the eye. So that distinctness or indistinctness of vision, as we have spoken of the matter hitherto, is not brought about by any mental state or mental process, and is innocent of any psychological significance.

We may, however, take a fourth instance of difference in clearness of vision, which will lead us to a very different conclusion. I take my seat once more, and direct my gaze upon the pattern before me; but as I look, my mind is busily engaged upon a scientific problem. I am reviewing in thought the controversy that has recently arisen regarding the aims of historical research,—balancing the pros and cons, wholly engrossed in the one train of thought. When I try subsequently to call up the impression that the pattern made upon me, as I sat thinking, I have to confess that at best I had only a fleeting glimpse of it, now distinct and now indistinct, and that there were times when I did not see it at all. Yet my eyes were kept constantly open,—apart from momentary interruptions by winking reflexes,—and were directed steadily upon one and the same spot. It is clear that, in this case, there can be no question of differences in objective clearness. Neither can this new observation be adequately explained by appeal to the peripheral or physiological factors. It may, of course, have happened that my eyes slipped a little, without my knowledge, from the exact point of fixation, or that there were slight changes from time to time in the state of accommodation; but it is obvious that occurrences of this sort cannot bear the full burden of explanation. On the contrary, I am very sure that my mental state at the time of observation, my intensive occupation with a definite train of thought, rendered it difficult or impossible for the visible object to gain access to consciousness.

Other instances may be adduced in proof of this influence of state of mind upon sense-perception. I do not hear the noises in the street, when I am entirely absorbed in work, although the objective and peripheral conditions for their perception are fully realised. My student lamp has been smoking for some time; but I did not

notice the fact until the smell had become so strong as literally to force itself upon consciousness. Now I have suddenly become aware of it, in a very unpleasant way. Again, my secretary is reading aloud to me. As I listen, I begin to think of something that I mean to do in the near future. When I have worked out my plan of action, I come back to the reading, and am made aware that I have lost some part of it; I cannot bring my knowledge of the subject-matter into relation with the words that I now hear. While I was occupied with my plan, the tones of the reader's voice, which I seem to have followed without interruption, were empty, meaningless sounds. Once more, we are listening to single notes played upon some musical instrument, piano or violin. The science of acoustics declares that these single notes are not simple tones, but consist of a fundamental tone and of certain overtones, whose character depends upon the nature of the instrument. If we have had practice in the analysis of these notes, we are able to 'hear out' the separate overtones, besides hearing the fundamental. But, again, it depends upon a peculiar mental attitude, or state of mind, whether we hear or do not hear the overtones. We may address ourselves to the note as an undivided whole, in which case its partial tones escape our notice.

These facts, and others like them, furnish the basis of the notion of *attention*. We say that it depends upon the attention whether sense-impressions—visual, auditory or what not—come to consciousness, or whether the details of a picture or the constituents of a note are made out or discriminated. And in saying this, we think of the attention as a state of mind which may be realised in greater or less degree, and may embrace at any given time a larger or smaller number of conscious processes. Having regard to the varying depth or intensity of attention, we ascribe to it the attribute of *concentration;* this we take to be greater, the more difficult it is to divert the attention from its present object. Having regard to the multiplicity of contents upon which it can fasten, we speak of various *directions* of the attention; thus 'local' attention is an attention directed upon a particular point in space. Further, in view of the variable number of objects with which the attention may be

occupied, we speak of its *distribution* as well as of its concentration. The distribution of the energy of attention, i. e., of its degrees of concentration, may itself be either uniform or variable. Lastly, we contrast attention with *inattention*, which signifies either a total lack of concentration or distribution, or at any rate a lack in some given direction; and we recognise in distraction a special form of inattention, a 'scatter-brained' state which manifests itself characteristically in inappropriate remarks and unsuitable actions.

Popular psychology, which perhaps found its most faithful expression in the experience-psychology of the eighteenth century, confuses in its idea of attention three very different notions: that of a *faculty*, the operation of which produces certain changes in the mental life; that of an *activity*,—the activity of remarking, noticing, observing,—always directed upon some definite content which is the immediate occasion of its exercise; and, lastly, that of a *state*, in which we continue for a longer or a shorter time, unaffected by changes in the contents of our consciousness. State and activity are alike conceived of as the effects or manifestations of attention in its first meaning, as mental faculty. That the same name should be used to designate both cause and effect is nothing unusual in 'common sense' psychology. The term 'will,' for instance, signifies on the one hand a faculty, a capacity for a considerable number of actions that are in certain respects alike, while on the other it denotes the individual act proceeding from this faculty. Nothing more could be said of the 'faculty' than that it is a cause, residing in the subject himself, of the occurrence of certain mental phenomena; and with such a definition there is nothing strange in the use of the same word for both cause and effect. We find precisely the same thing in physics. The word 'gravitation,' for example, is used on occasion for the unknown cause of all those processes or properties that together constitute the facts of gravitation.

It is the aim of modern science, physical and psychological, to supply a concrete filling for such indeterminate concepts, to characterise more definitely the nature of the cause in question, and wholly to eliminate the colorless, abstract, empty and misleading notion of force or faculty. But to obtain a knowledge of causes

or, in more modest terms, to pave the way for this knowledge, we must have recourse to an exact study of the facts themselves. Modern psychology has been able to gain a deeper insight into the phenomena of attention, by subjecting them directly, in their qualitative and quantitative aspects, to careful investigation. In what follows we shall attempt, in the light of the results thus obtained, to develope a comprehensive view of the nature and functions of attention. The distinctness or indistinctness that results from attention or lack of attention we shall designate, in contradistinction to the objective and peripheral forms, as *psychophysical* or *central*. As we are here concerned with facts that are not dependent upon any particular group of conscious contents (e. g., the sensations of a single sense-department, or the ideas of perception), we may speak in quite general terms of distinct or indistinct 'consciousness' and of its degrees.

II.

The first and most important problem that arises, in a discussion of the attention or of the degrees of consciousness, is, of course, that of an exact determination of the nature of the attentive state. Wherein does this psychophysical distinctness or indistinctness consist? How are we to distinguish it from the objective and peripheral forms? Modern inquiry has proved, in the first place, that there is, as a rule, a close intrinsic connection between attention and the processes and mechanisms that subserve what we have called peripheral distinctness. If I turn my attention to some object in the room, my gaze is at once and involuntarily directed towards this object, with the appropriate degree of accommodation. But if, as I contemplate the object, my attention shifts to some topic of thought; if, as the technical phrasing runs, it changes from a 'sensory' to an 'intellectual' attention; then the muscles of accommodation involuntarily relax, and the lines of regard tend to take a parallel direction; it is as if I were looking into an infinite distance, where there are no objects to be observed. True, this connection between sensory attention and the adjustment of the sense-organ concerned—an adjustment that secures the peripheral

distinctness of the observed impression—may, within certain limits, be weakened or even abolished, though not without especial pains and practice. We are able, with a certain effort, to bring the objects seen in indirect vision to the forefront of attentive observation. One sometimes meets people in society who possess this power in a marked degree. While their eyes seem to be gazing steadily at what is in front of them, they are secretly alert to what is happening on either side. But this sort of incongruity between central and peripheral distinctness is, of course, impossible save in cases where the physiological mechanism is directly controlled by the will. Movements of the eyes are voluntary; change of accommodation is not. Hence we cannot break down the natural connection between accommodation and attention unless we direct our gaze upon an object which is not the object of attention, or attend to an object that lies outside the range of accommodation.

Vision is not the only sense-department in which these peripheral changes of distinctness occur. If, for instance, we are seeking to identify an odorous gas, we make a number of short, sharp inspirations: we 'sniff' at the flask. And again, to bring out a taste distinctly, we make certain movements with the tongue, whereby the stimulus that we are examining is crushed and diffused. It is, indeed, a general rule that peripheral distinctness and central distinctness go hand in hand; and it is not easy, without special investigation, to say how much of the total effect is due to the one factor and how much to the other. We run a very real danger of ascribing to attention, i. e., to a determinate mental state or attitude, results that are actually conditioned upon the special adjustment of the sense-organ concerned.

There is a further difficulty. If we are to have any exact knowledge of the degrees of consciousness, we must be able to vary them at will. In other words, we must be in a position to induce, at our pleasure, this or that grade of psychophysical distinctness, as independently as may be of all extrinsic influences. Experience shows that there are but two ways, in the normal waking state, by which this end may be accomplished. We may either

distract the attention, or we may divide it. Now distraction of the attention, in the strict sense of the term, means the inducing of inattention, i. e., of the lowest degree of consciousness; so that, if we are to obtain any other grade of psychophysical distinctness, we must have recourse to a division or distribution of attention. But again, when we have reduced a given degree of concentration to a lower level, by this division of attention, we still have no standard by which we might measure the change of consciousness. For, as was said just now, the distribution of the activity of attention may be anything but uniform. As I listen to an opera, my attention is held, first and foremost, by the scenes that are enacted upon the stage and by the voices of the performers, while the music of the orchestra recedes into the background. But this attitude of mind need not persist; in scenes where the plot moves but slowly, it may be entirely reversed. In this, then, as in many other instances, there can be no question of a really uniform distribution of the energy of attention.

Furthermore, the power of a stimulus or an occupation to distract the attention does not remain constant. If it is often repeated, we grow accustomed to it, and have little difficulty in meeting the demands which it lays upon us. It thus gradually loses its original power of dividing or diverting the attention. It is clear that, if we are to induce a determinate degree of consciousness, we must know, first, the mode of distribution of the total energy of attention over the separate conscious contents included within its range, and, secondly, the distractive value of the process which we have selected for our purpose. Now no general rule can be laid down under either heading; the results that have been obtained hold only in particular cases; so that, from this point of view also, the investigation of attention is peculiarly difficult. So much we may say, and no more: that the distribution of attention brings with it a reduction, and concentration of attention an enhancement, of the degree of consciousness for a determinate content. Psychologists have not yet attained to any quantitative formulation of these changes.

There is still a final obstacle to the systematic treatment of the

phenomena of attention. When we attempt to study the changes in conscious contents that follow upon a partial withdrawal of the attention, we find that the very conditions of our inquiry are hostile to any adequate account of the altered experience. It is essential, if we are to describe what we perceive, that we hold (or are able to hold) our attention upon the objects presented. The more effective the distraction, the more imperfect is our portrayal of consciousness. Suppose, for instance, that we are asked to reproduce the contents of a page, which we have read while our thought was wandering from the subject of the book; there will be many gaps and errors in our recollection. And what holds of reading holds in like manner of quite simple tests. Suppose that we are comparing two sounds of given intensities, made by the fall of an ivory ball upon a block of hard wood,—the one heard under conditions of complete attention, the other while we are engaged upon some arithmetical problem: our judgment as to the relative intensity of the sounds is extremely uncertain. But we have no other appeal; our only means of instituting a systematic comparison, of obtaining anything better than the chance results of occasional observations, is to make our experiments and accept the report that follows. It is clear that the whole outcome is equivocal. We cannot tell how much should be ascribed to the changes in consciousness, and how much to mere inadequacy of description.

III.

All these possibilities and difficulties must be borne in mind by any one who seeks to interpret and explain the facts of the psychology of attention. The first of these facts to notice is that the *comparison and discrimination of sense-impressions* are seriously affected by division or diversion of the attention, in whatever way produced; whether the observer be called upon to work arithmetical problems, to follow a narrative as it is read aloud to him, to name or identify other sense-impressions, or what not. Not only do the judgments of comparison show large variations, indicate a wide margin of uncertainty; but the just noticeable difference, the 'differential limen,' as it is technically called, also reaches an unusu-

ally high value. The sensible discrimination, that is, the capacity to distinguish and to compare, is, again in technical expression, both 'coarser' and 'less' than is normally the case. For example, with complete concentration we are able in 70 per cent. of all tests to recognise the difference between two weights of 50 and 55 gr. laid successively upon a given area of the skin. But if the attention be distributed, by one of the above mentioned methods, we perceive the difference only in 40 per cent. of our tests.

How are we to explain this result? What are the processes that co-operate to bring it about? That the subjective difference between the weights is so much reduced by reduction of the attention can hardly be ascribed to any peripheral, physiological cause. For the stimulation is the same in both cases. We do not know that the skin possesses any mechanism of accommodation to pressure; but the only effect of such a mechanism, if it exists, would be that the weights themselves, as they were applied, should appear heavier or lighter. And this absolute shift of subjective intensity would, of course, neither increase nor diminish the difference between the two. Let us suppose, for example, that the distribution of attention co-operates with some such mechanism of accommodation to reduce by 10 gr. the value of each of the weights for sensation. We should then have to do with weights of 40 and 45 gr. The original, objective difference stands to the smaller of the weights in the ratio 1:10; this ratio has now increased to 1:8. Now Weber's Law lays it down that the sensible discrimination depends solely upon this matter of ratios; that it increases or decreases according as the quotients are larger or smaller. Consequently, the difference between 40 and 45 gr. ought to seem larger to us, and therefore be recognised in a larger percentage of tests, than the difference between 50 and 55 gr. Hence our assumption that a peripheral, physiological change co-operates with distribution of the attention to affect our sensible discrimination has led to a conclusion which is diametrically opposed to the observed facts.

We see, then, that peripheral changes cannot explain the lowering of sensible discrimination that comes with distribution of attention. And it is clear that what holds of the peripheral holds

also of the central conditions of sensation. We cannot imagine that a weakening of the excitatory processes in the cerebral cortex —such as might result from lessened excitability of a sensory center—would bring about a reduction of the apparent differences between them. Nor can we give any reason for a diminution of their objective difference, that is, for the approximation of the excitatory processes themselves. We are, therefore, forced to ascribe the observed change in sensible discrimination to the degree of consciousness, the mind's own power of apprehension. And this conclusion takes us a step farther. The effect of one and the same difference of sensory excitation, a difference mediated by just the same peripheral and central elements, will be greater or smaller according as we are more or less disposed to receive it, more or less prepared to apprehend it. This *preparedness* consists in the excitability and revivability of ideas that may be employed for the required comparision of sense-impressions. To these must be added, further, the mental activities that subserve speech,—in this case the naming of conscious contents and their differences; while, lastly, the motor innervations that precede the deliverance of a judgment of comparison may also be more or less 'prepared.' At this point, then, we may say that distribution of attention implies a lessened excitability of all the processes concerned in the apprehension and communication of the contents of perception. And it is now easy to understand why the difference must be increased if our tests are to give the same number of correct judgments as we obtained with complete concentration.

The principle which we have here laid down may be extended to all sorts of differences between sense-impressions,—qualitative, temporal, and spatial. We may, then, generalise it to read: a distribution of attention means a lowering of sensible discrimination. Our apprehension of the external world attains its greatest certainty and delicacy only by aid of an unconditioned concentration. At the same time, this law gives us our first real insight into the nature of psychophysical distinctness and indistinctness. The contents of consciousness, as revealed to us by introspection, are determined not by the excitations of sense, but by all the manifold

modifications that these excitations undergo when they cross the threshold of consciousness. There is no single sensation that has not been wrought upon in this way by a thousand busy influences. What a sensation would be without them, we cannot possibly tell; we carry with us a store of experiences and ideas, and we cannot escape from our past. Only the distribution of attention throws a certain light upon the phenomena, and shows us something of what mental processes may be that have no related states or processes to welcome them to consciousness. It seems that, in this state of attention, differences are diminished, and there is formed an obscure total impression that acts as a darkened background to raise into still higher relief the main events of consciousness.

We are now in a position to review and to estimate the *influence of attention upon sensitivity*. We mean by sensitivity the capacity to apprehend sensations in their absolute character; to experience a tone or color or smell as a peculiar content of consciousness, and to define its various attributes of quality, intensity, and duration. The first important point to notice is that we are able by attention to favor any one of these attributes at the expense of the others. If I concentrate my attention upon the pitch, i. e., upon the quality of a tone, my capacity to determine its intensity or duration is diminished. Further distribution of the attention enhances this effect. In particular, there is a tendency to underestimate the quantitative aspects of an impression,—its intensity, duration, and spatial extent,—when the degree of attention bestowed upon them is lessened. No such influence has as yet been made out in the case of quality: distribution of the attention does not raise or lower the pitch of a tone, and does not tinge a red either with yellow or with purple. But any impression, however insistent, may pass wholly unobserved, when distraction of the attention has reached a certain limit. We then have no ear for the loudest noise; and intensive smells and glaring colors are entirely unremarked.

It is but a very small proportion of these facts that can be referred to peripheral conditions. The mechanism of adaptation with which, as we have seen, certain of the sense-organs are pro-

vided, can effect but a slight decrease in the intensity of sensation. All further change must be credited to the account of attention. The fact that one attribute of sensation can reach a high degree of consciousness at the expense of others shows, perhaps more clearly than anything else, the vanity of an appeal to peripheral factors. For we find no trace in the sense-organs of a mechanism that should, for instance, diminish intensity or extent or duration for the benefit of quality.

We can, then, grant to peripheral conditions but a relatively insignificant share in these changes of sensitivity that come with a divided attention. The question now arises, whether we can point, with any degree of certainty, to the real conditions of the described phenomena. There are, we may conjecture, only two factors to be considered: preparedness for the particular sensations, and susceptibility to the ideas which the sensations are able to revive. An impression will come the more easily to consciousness, the better we are prepared for it. Where there is increased excitability of the corresponding sensory centres, it is possible for comparatively weak stimuli to set up an excitation that shall be adequate to the touch-off of a sensation. The required increase of excitability may be effected, e. g., by the state of expectation. If I am expecting a determinate sense-impression,—say, the tone of a bell or the lighting of a lamp,—I perceive it, when it appears, with especial quickness and distinctness. This preparedness for certain sensations does not imply any enhancement of their intensity: we may be prepared for weak as well as for strong impressions, and a faint sound may, on occasion, find easier ingress to consciousness than a loud sound. Hence the parallelism which, within certain limits, has been shown to obtain between increased intensity and increased concentration is not a fact of fundamental importance. It simply means that a tone, e. g., may appear louder than another tone, not only when it is objectively and peripherally the stronger, but also when we are especially well prepared to receive it.

Here again, therefore, we must lay particular stress upon the second of the two factors just now spoken of: the preparedness for all those ideas (or, more generally, for all mental acts) which

help us to assimilate, to interpret, and to define the impressions that we receive. Every new-comer to consciousness, every new conscious content, has a certain *tendency to reproduction*, that is, a certain power to call up or call back other ideas. For instance, I hear some one say "To be or . . ."; and at once there arises in me the tendency to add "not to be," and to go on with the monologue. Or I make my first visit to a picture gallery, and see a portrait, the style of which is familiar to me; I am at once reminded of the name of the painter, though he was not at all in my mind when I entered. The tendency to reproduction that a given idea possesses is dependent upon the permanence of the *association* subsisting between it and the idea which it recalls. This 'association' between two ideas is formed when they are simultaneously present in consciousness or succeed each other at not too long an interval. The more frequently the connection is realised, the more lasting will be the association of the ideas, and the stronger the tendency that each has to reproduce the other. It should be said, also, that ideas which are merely *like* one of the originals possess an equal or similar tendency to reproduce the other, despite the fact that they have never been associatively connected with it. A portrait that I now see for the first time may call up the name of a certain painter, —because its style is *like* that of the portraits with which I am familiar,—just as certainly as these portraits themselves. The effect of the association in this case is evidently indirect.

Now there can be no doubt that impressions for which we are prepared have a stronger tendency to reproduction than have sensations whose path to consciousness is not smoothed by any special susceptibility. But our 'preparation' for an impression means a special preparedness of all the ideas that are reproducible by it. The facts constrain us here, as they did just now when we sought to explain the influence of attention on sensible discrimination, to regard this factor of preparedness as extremely important. If the direction of attention can be so nicely regulated that we are able to attend to some one attribute of a sensation and neglect the rest, then assuredly we have more than can be accounted for by an enhancement of excitability in the sensory centres, and a consequent

increase of tendency to reproduction. Without some further condition, we cannot explain how it happens that the pitch of a tone may be better 'prepared for' than its intensity or duration. So far as these attributes are concerned, the excitation is just as much an indivisible unity as is the sensation or the stimulus. But every one of the three attributes has its own associative connections with other ideas. We have, then, only to imagine that the group of mental processes connected with the quality of an impression has attained a higher degree of preparedness than the group associated to intensity or duration, and we can readily understand that the former will be more clearly perceived and more easily identified than the latter. And the same explanation will hold of those typical instances of attention that we selected at the outset of our inquiry. We do not hear the noises in the street below; we do not see the pattern on the wall before our eyes. These things do not mean that the excitability of the sensory centres has fallen too low; but rather that consciousness is preoccupied, i. e., that the ideas reproducible by the impression are not in preparation.

A third fact in the sphere of sensory attention is the *analysis of complex perceptions*. So important is this analytical function, that some writers make it the fundamental fact in the psychology of attention. As instances of its working, we may cite the hearing of overtones in a clang, the tracing of simple motives in some ornate design, the tasting of a particular ingredient in a highly elaborate dish. As a rule there is little difficulty in bringing these cases under our first two heads. For it is obvious that the analyses imply the work of sensitivity and sensible discrimination. The differentiation of a content from other contents, simultaneously present, and its definition in absolute regard, without respect to these others, are the basal processes which every analysis presupposes. It follows, then, that the factors involved in attentive analysis are a preparedness for the constituents which the analysis is to discover, and a susceptibility to the reproductive influences which these constituents exert.

It is a well known fact that our analysis of a complex impression is greatly facilitated if its constituents have previously pre-

sented themselves in insolation. When the tone, which we are to hear as overtone in a given clang, is first sounded by itself upon the instrument, it stands out much more clearly in the mass of sound. When a friendly finger has traced the outline of the figure concealed in a puzzle picture, we have no difficulty in finding it again for ourselves without assistance. Our susceptibility to an impression is greater, if the impression has recently formed part of our consciousness. Now it is clear that this state of affairs is not the work of attention. The mere repetition of the stimulus sets up a tendency to its renewal, to its reception at some later time. We may have strained our attention to the utmost, and yet have been unable to hear the overtone or to see the concealed figure. Now that the stimuli have been given separately, the task offers no especial difficulty. What is it, then, that has happened in the mean time? And how do facts of this kind help us towards a knowledge of the nature of attention?

It is certain that our preliminary hearing of the overtone by itself has made us better prepared to hear it as overtone in the clang. This means that our previous preparation for the recognition of the tone in question was inadequate. Hence, the reason that the attention at first failed to perform the task of analysis set it by the clang is that its direction was too indefinite, that it could not adjust itself accurately to the required object. The attention, that is to say, cannot overcome difficulties of its own intrinsic power, but is always and everywhere dependent upon the preparedness of our ideas. If there is no preparation, then there is no analysis, no recognition, no perception. Any impression, or aspect of an impression, that can be taken in with complete attention, has been prepared for by previous experience, and serves to realise specific tendencies to reproduction. Once more, then, we are forced by facts to the conclusion that the mental state or attitude which we term attention consists in the preparedness of the ideas reproducible by the various contents of consciousness.

IV.

All the phenomena of which we have so far spoken are due to the lessening of concentration and to the repression of those changes in conscious contents which concentration effects. We have considered distribution only so far as it brings with it a lowering of concentration. At this point, however, we may raise the further question of the *influence of division or distraction of the attention upon the range or number of the objects which it embraces.* We can put the matter to test by a simple experiment. By help of an instantaneous shutter, we can project upon the screen of a camera, say, for a tenth of a second, a number of letters that do not 'make sense' or combine into a pronounceable syllable. Let us arrange them in three lines of four letters each. The observer is instructed, beforehand, to keep his gaze fixed upon the part of the screen where the letters are to be exposed. He is placed at such a distance from the camera that all twelve letters may be 'peripherally' distinct while his eyes remain unmoved. He is asked, first of all, to read as many letters as he can with undivided attention during the interval of exposure, and to report what he has seen as soon as the shutter closes. The result of the experiment is that he can name only six letters. In a second test—for which, of course, new letters must be employed—the observation is made under distraction. The observer may be required, for instance, to repeat aloud the series of whole numbers, beginning with 1, and omitting six numbers at each step, i. e., 1, 8, 15, 22, etc. When the count is in full swing, the letters are again exposed. He can name no more than three of them.

The experiments show, then, that distribution of the attention reduces the range or number of the objects that can be simultaneously grasped with complete concentration. The reduction cannot be referred to peripheral causes; for we have taken especial pains to make the peripheral conditions of the two tests the same. Moreover, the three letters that are seen in the second case are not less distinct than the former six; and it is difficult to understand how the peripheral conditions of perception should have sufficed for

these three, and not for their immediate neighbors as well. We are thrown back, therefore, upon the same factors to which we have earlier appealed for explanation of the phenomena of attention. The exposed letters find us more or less well prepared to receive them, and thus gain a more or less ready access to the consciousness of the time. Our susceptibility to impression by the visible symbols is, without any doubt, greater in the first and less in the second experiment.

Nevertheless, the question still remains why the subjective effect of a division of attention should be to reduce the number of the constituents in a total presentation, and not rather to make the presentation itself uniformly indistinct. *A priori*, the second alternative is as probable as the first. The observer, while he was engaged upon his counting, might have seen just as many letters as he saw before, without being able to identify and name a single one of them. In this case, then, our explanation seems to halt; it gives no reason for our perceiving fewer letters than we perceived with complete concentration, but perceiving these few with practically the same distinctness. In reply, it may be urged, first of all, that, as a matter of fact, our susceptibility to the different letters is not precisely the same. It has been proved, by special experiments, that some letters are read more easily than others. Moreover, we are quite safe in assuming that there are differences of preparedness or of central excitability,—accident favoring certain portions of the field of vision, or certain objects, more than others. And it is reasonable to think that such differences, once present, will lead us to see a smaller number of letters with approximately equal distinctness.

All this, however, is vague supposition. Much more important is the fact that it *is* possible, by division of the attention, to induce simply a general indistinctness of the whole presentation. In the experiment which we have just described, the observer was asked to read as many as possible of the letters during the brief interval of their exposure. That is to say, his instructions were couched in terms that of themselves laid a certain stress upon the separate constituents of the impression, i. e., upon analysis. But

we can attack the problem in a different way. We can repeat the experiment, requiring of the observer that he shall try to see as many letters as possible, and then merely give their number; he need make no effort to name them. Under these conditions, he estimates the number of the letters seen with complete attention at twelve, and can name no more than two or three. When his attention is distracted as before, by the counting, he sees ten letters in all, and cannot name a single one; the whole number appear together as an indistinct mass.

We see, then, that the simple change of instructions makes a very great difference in results. The decrease of the range of attention is now comparatively slight; but the degree of consciousness has been lowered for all objects alike. The whole visual impression has taken on the character of extreme transiency. The effect produced is much the same as that which we obtain with complete attention by shortening the time of exposure. Hence there can be no doubt that the outcome of this sort of experiment is largely dependent upon the adjustment of attention, the particular kind of preparation,—in a word, upon predisposition. Just as we may be susceptible to one and only to one of the attributes of a sensation, so may we take this or that attitude, be thus or thus prepared, as regards the number of contents that is to be expected. If we are predisposed to read individual letters, we shall do one thing; if we are merely prepared to perceive as many letters as possible, we shall do another. This difference in the adjustment of attention need not, of course, be voluntary; it may be due to causes that lie beyond our volition. But its influence can be traced more clearly and more easily in the case of voluntary attention, because here we can better take account of the constellation of ideas that has formed in consciousness.

There is still another peculiarity of the attention that we must not pass without comment. If we compare the results of the two experiments with complete concentration, we see that, in the first, more letters were read, but less of the total impression was seen, than in the second. The same conclusion follows from a comparison of the experiment with divided attention. There must, then,

be a peculiar relation obtaining between distribution and concentration. The greater the range of attention, the lower is the degree of consciousness attaching to any individual content; while, *vice versa*, the number of the objects grasped by attention decreases, as concentration upon any one of them increases. Since, now, we can measure the work of attention not only by degree of concentration, but also by the range of objects attended to, this correlation of the two—increase in the one direction meaning decrease in the other and conversely—leads us to the idea that the *energy of attention is limited and approximately constant in its limitation.*

This idea is supported and confirmed by the following fact. When we ask how the degrees of consciousness are related to one another, we find, not a uniform gradation from the highest to the lowest, but, in most cases, a fairly sharp line of distinction. Certain contents stand at the level of clear apprehension; and from them our consciousness drops away, without transition, to the level of obscure general impression, above which the other contents of the time are unable to rise. And the clearer the first group of contents, the more indistinct are all the rest. It follows, then, that an increase of concentration for certain processes implies a decrease of concentration for others. This important fact is our sole justification for opposing—natural as the opposition seems—attention to inattention, distinct to indistinct consciousness. If, therefore, at any given moment we make a cross section of the stream of consciousness, we shall find represented on it, not all conceivable degrees of consciousness, but as a rule just two groups of processes separated from each other by a considerable interval. We thus have the right to conceive of attention and inattention, and to bring our experimental methods to bear upon them, as two wholly distinct states of consciousness, rather than as degrees of the same state connected by intermediate stages. At the same time, we have a further suggestion of a certain constancy in the amount of available energy; only that we are now dealing, not simply with the energy of attention, but with the total energy of consciousness itself. For attention and inattention, extending as they do in different directions from a common point of indifference, include all con-

ceivable degrees of consciousness. Attention may rise to the level of the greatest possible distinctness, and inattention may sink into the limbo of the unconscious.

These facts, again, may be illustrated without difficulty from the occurrences of every-day life. The teacher, in his endeavor to guard his pupils from mind-wandering and distraction, seeks to bring their attention to the highest possible degree of concentration for the subject which he is discussing. He attains this end most certainly if he can connect the new matter with something already known and familiar, that is, if he can secure a maximum of preparedness for the new ideas. Again, the occupation that fills our mind most completely, i. e., that meets with an especially favorable reception from our present store of sensations, ideas and experiences, is at the same time that which makes us deaf to other claimants for the attention and inaccessible to other stimuli. The best way to overcome fatigue, pain, ill humor, distressing or irritating circumstances,—to make ourselves insensible to them,—is to apply ourselves to the task which we know by experience will lay the strongest hold upon attention. All these phenomena point to the importance of preparedness for the processes of attention, and thus serve to supplement our theoretical discussion. At the same time, they enable us to trace the constancy of the energy of attention, which (as we have maintained) finds expression in the inverse relation of cencentration and distribution, to the constancy of the more extended energy of consciousness. That increase of degree is necessarily connected with decrease of range of consciousness finds its explanation in the fact that, while the degree of indistinctness remains the same, only a determinate amount of clearness in consciousness is available.

V.

Our discussion of the nature of attention has made it clear that the excitability and preparedness of ideas are the determinant factors in its operations. It is, then, to be expected that *memory and recollection, reproduction and association,* will be peculiarly dependent upon the processes to which the name of attention is given. And

as a matter of fact they are thus dependent to an extraordinary degree. The greater the concentration, the more active, first of all, is the *tendency to reproduction* of the conscious contents upon which attention is directed. The man of science who is engaged upon a definite problem, the artist who is seeking to realise a definite idea, the orator who is following out a definite train of thought, all alike are at special pains that the main issue of the task before them shall receive a full measure of attention; for in this way their whole furniture of ideas is made more available, more accessible,—the stream of consciousness runs more freely and smoothly. Only the connections that have become mechanical suffer when their terms are thrown into relief by voluntary attention. For the constructive work of creative imagination or original thought, the active co-operation of attention is absolutely necessary. It is the essential condition of all the higher forms of mental activity, theoretical and practical. It makes possible, as it continually assists, the policy of the statesman, the projects and achievements of the technician, and the combinations and inferences of the mathematician. We say that a man shows genius, when he discovers new aspects or new attributes where all the rest of the world have passed by unheeding. But such discovery demands an absolute impartiality of attentive observation, and the freedom from current views and prejudices, consecrated and confirmed by habit and tradition, which this observation implies.

Secondly, the contents that are apprehended with complete concentration, the *apperceived* contents, as they are often termed, gain a quicker and a more lasting hold upon *memory* than those which meet a divided or distracted attention; and are, therefore, when occasion arises, more easily and accurately reproduced. What is obscurely experienced ('obscurely' in the sense of psychophysical indistinctness) is but imperfectly recalled; we cannot give any confident opinion about past events unless we apperceived them at the time of their occurrence. We may "dimly remember" that something happened; but, as conscientious people, we shall "prefer to say nothing definite about it." Nor is the attention of less importance, thirdly, in the formation of *associations*. When

the contents of consciousness, simultaneous or successive, fail wholly to attract it, no amount of repetition can effect a permanent and effective association between them. It is waste of time to try to memorise rules or dates or formulæ, when one is distracted. How serious the waste is, we may infer with some approach to accuracy from an observation made in a different connection. It has been found that the time required to learn by heart a series of nonsense syllables is about ten times as long as that required to learn, equally well, the same number of short words. Now the words repeated by the inattentive student are transformed, by his inattention, into a set of meaningless syllables. Hence it will take him at least ten times as long to master his task, in this state of mind, as it would if he gave the subject his undivided attention. I say "at least" advisedly: for the inattentive student will, of course, accomplish even less than the observer who does his best to learn the nonsense syllables. Special experiments have been made to determine the influence of distraction, of a secondary occupation, upon the observation and memorising of letters, displayed one after another in quick succession; with the result that, under such conditions, the observer is wholly unable to retain or to recall the arrangement of the stimuli, their position in the series. The few letters that he has recognised, and can later reproduce, come to him as mere disconnected fragments, not as members of a circumscribed and orderly group.

The fact, then, is clear enough,—that attention is essentially concerned in retention and reproduction, in every act and function of imagination and memory. And the explanation is equally clear, when we remember that 'attention' implies the preparation of the ideas that we are seeking to reproduce, and the opening-up of their particular associative connections. 'Attentive learning' then means, simply, a learning under favorable conditions of preparedness and of tendency to reproduction. And complete distraction must mean, on its side, a reduction of both these favorable conditions to a minimum; the practical impossibility either of taking up a given idea into the memory, or of reproducing other ideas. But this conclusion seems to bring us into conflict with a point of

fact which we touched on, briefly, a short time ago: the fact that an *automatic connection of contents or movements*, a connection that has been made and established once for all, has nothing to gain from the intervention of attention,—nay, suffers a very positive loss in accuracy and rapidity of realisation, if the attention be directed upon it. Repeat to yourself a piece of poetry that you have learned by heart, and try, as you proceed, to give each separate sentence a full measure of attention: try to apperceive each successive incident of your morning's toilet, or of the formation of the letters in writing. What is the result? Your habitual associations break up and refuse their office; your hands are clumsy; you lose the thread; it is only by thinking the matter out, circumstantially, that you can continue a process which ordinarily runs smoothly and certainly to its conclusion. You made yourself master of this automatic sequence of activities, in the first place, by help of concentrated attention. Now that you have reached the goal, an apperception of the separate phases is disturbing and paralysing.

A closer consideration will, however, enable us to harmonise these outstanding facts with our explanation of the phenomena of attention. For, in the first place, we have not asserted that the course of each and every organic process is favored by the attention. Nutrition and digestion, circulation and respiration, and many other related bodily activities, discharge their functions in orderly fashion for the benefit of the organism, without the least participation of consciousness and apperception. It is this same mechanical precision that we find in the activities mentioned above, which run their course most surely and certainly in the twilight of consciousness, or even in unconsciousness itself. If, then, the bringing of these processes into the full light of conscious apprehension diverts them from their accustomed path, the inference is simply that they (or, rather, their constituents) are thrown by apperception into new and disturbing relations. A single link in the chain of interconnected processes is now isolated and set in a novel context; with the result that its original effectiveness is destroyed. Diverse tendencies to reproduction are mutually exclusive. The attentive observation of one term in an automatic train

of mental or muscular activities 'prepares' a special set of ideas, very different from the terms that in the accustomed order of things would naturally follow it. It is not surprising, therefore, that the direction of an analytical attention upon these habitual sequences of mental or bodily process should mean a balk, an interruption, a loss of memory. It may be that the processes themselves are governed from subcortical brain centres, and not from those higher centres with which are connected the conscious contents experienced in the state of complete attention. If this be true, we see still more clearly why the raising of single terms of an automatic connection to the level of psychophysical distinctness must of necessity weaken or destroy the associative relations that obtain between them.

We must not close this discussion without reference to a further peculiarity of attention, the *relative slowness* with which it passes or travels from one content to another. If, for instance, we listen to a series of sounds which are a quarter of a second apart, —say, to the ticking of a watch,—we find it impossible to grasp each separate impression by a separate act of apperception. We have not time, in the brief interval that elapses after the hearing of the first stimulus, to readjust our mind for the second. The sound 'gets ahead' of us, and we soon give up our fruitless endeavor to overtake it. The consequence is that, at a certain limit of rapidity, every series of impressions breaks up, involuntarily, into groups. These groups are the foundation of all rhythmical articulation and division. We distinguish, in any given rhythm, between an accented term, and one or more unaccented terms. The accented term is apperceived; the others follow it too quickly to receive special apperceptive emphasis. It is clear, then, that the interval separating the accented terms of a rhythmical series gives us a measure of the rapidity with which successive acts of attention may be realised. With simple sound-impressions, and under favorable conditions, this interval is, approximately, one second. Similar phenomena have been observed in the process of memorising nonsense syllables by reading them aloud. At a certain rapidity of reading, the syllables fall of themselves into rhythmical

groups; and it has been proved that juxtaposed terms which belong to one and the same group, the same rhythmical 'foot' or 'measure,' are more firmly associated than juxtaposed terms which belong to different groups.

These facts, and others like them, have led psychologists to speak of a distribution of the energy of attention. Such a distribution occurs, to some extent, in the case of automatic sequences; for there are always certain terms in the series that receive a measure of apperception, however small, while the rest follow as it were in the train of the accented members. The speaker who is delivering an address that he has learned by heart gives special attention to certain cardinal points of his argument, believing that the mechanism of association of ideas will then provide for the smooth and logical development of the subordinate sentences. So that even in activities like this, where term seems to follow term altogether automatically, there is still some part to be played by the attention. But if a term that was originally unaccented, and that has its fixed subordinate place in the whole sequence, is suddenly apperceived, the train of thought will necessarily be deranged: the idea has been raised from its menial position to take all the responsibilities of a new series, to become the independent starting-point of further associations, and must, of course, break off its old connections. At the same time, the flow of the speaker's ideas will be retarded; the attention requires time to meet the demands laid upon it. Now we may freely admit that, in the complicated activities of real life, the groups are incomparably larger and the unaccented pauses indefinitely longer than they are in the simple experimental tests that we have described; but the underlying principles are in all cases the same. In real life, as in the laboratory, the accented term lays down the law for the whole series of unaccented processes that follow, in the sense that, when once the first term is given, the rest of the series runs its course with automatic precision and at unvarying speed. Each successive member of the group is determined by all the members that have gone before; and the first accented member contains within it the tendency to reproduction of all later members, i. e., of the whole group.

Now we have seen that the connection between any two groups is weaker than the connection between the members of a single group. It follows, then, that the interference of attention at unaccented parts of the series will also serve still further to weaken these wider associative connections.

We see, therefore, that the paralysis or interruption of automatic activities, by concentration of the attention upon some one or other of their phases, affords no argument against our attempted explanation of the processes of attention. On the contrary, the facts give us an interesting glimpse into the economy of mind. As an experience becomes accustomed, practised, familiar, it gradually loses in psychophysical distinctness; it approaches, and presently falls below, the limen of consciousness. Its course is then both speedier and more certain; it has grown mechanical. And while this is happening, consciousness itself can turn with increasing energy to the novel and the unaccustomed, guiding them into the right channels of reproduction, and shaping them to useful ends. Mind is thus relieved of a heavy burden: its processes, once trained to their duty, may be removed from the control of attention and left to their own devices, without fear that they will wander from the path prescribed for them. Attention is like the watchman on some high tower, who, as he surveys the country beneath him, casts an indifferent eye upon the familiar incidents and unsuspicious figures of the landscape, but keenly scrutinises any strange appearance. We have a very delicate sense for what is familiar and what is unfamiliar. Some psychologists, accordingly, believe that accustomed impressions take on a special attribute, a 'quality of familiarity,' which can make a thing appear familiar to us, without our being able to say where and when and under what circumstances it formed part of our past experience. But we may say very much the same thing of the novel and the unfamiliar: the 'quality of unfamiliarity' consisting, in part, of a certain restlessness and excitement in face of the experiences, and partly of the peculiar mood of *interest*.

Interest is a pleasurable mood, into which we lapse whenever anything 'attracts' or 'fascinates' our attention, i. e., arouses the

activity of those higher centres which form the immediate substrate of consciousness. So close is the connection between attention and interest, that the latter term is sometimes used to denote attention itself, and even to designate the objects which excite and sustain attention. When, for instance, we say that a man's interests are wide or narrow, we mean by "interests" the whole range of objects that may engage his attention. When, again, we remark that our interests lie in a certain direction, or insist that our friends ought to take an interest in certain questions, we are employing the word as an equivalent of "attention." In view of this uncertainty of usage, it is necessary for science to select and steadfastly to adhere to some one meaning: otherwise the term loses all its value. And the best meaning is, evidently, that of the mood or emotional state which invariably accompanies a strain of the attention, provided that this strain is not pushed so far as to induce fatigue and dull the faculties. The pleasurable mood of interest is very readily aroused by novel impressions, which have no fixed associations with previous experiences or stereotyped phrases. True, an increasing store of ideas, while it enables its possessor to meet and assimilate new perceptions and thoughts more quickly and easily, also sets narrower and narrower bounds to his susceptibility for the unaccustomed and the unknown. The capacity of the mind to enlarge its horizon, to multiply its aptitudes and experiences, is exceedingly limited; though we must add, in fairness, that it differs very greatly in different individuals. This is the reason that the number and variety of interesting objects are greatest in youth, and least in old age.

This decrease in susceptibility to new impressions is, in some measure, compensated by the imperfection of memory and the changes which naturally occur in our furniture of ideas. Thanks to these two influences, the familiar does not always remain familiar, but after a long interval regains something of the character and stimulus of novelty. A problem that has occupied us without interruption for a considerable period of time comes finally to be associated with a whole number of accustomed ideas, which go far to dull our interest in it and to prevent or obscure the removal of

outstanding difficulties. If we then lay it entirely aside, and return to it later from a different kind of work, we find that the very points which previously attracted but little attention strike us with all the force of a new impression and indicate, or at least pave the way for, a final solution. This is the experience of every one who has worked and thought on scientific matters. It is also the experience of the artist when he pursues an idea and attempts to give it shape; and of the inventor, when he seeks to put theory into practice. Facts of this kind are usually explained on the assumption that the earlier efforts have left their effect upon the subconsciousness and that the later advance is possible only because the mind has been silently at work. The explanation may hold in certain cases, where the interruptions of conscious occupation with a problem are but short. But we are thinking here of longer intervals,—intervals so long that the old and familiar come to us with the charm of novelty, that the mechanical and habitual connections are weakened, their certainty imperilled, and their binding force reduced. The whole problem, or whatever it may be, stands out in the clearer light of attentive consideration; it forms new connections, and enters into new associations. Furthermore, our stock of ideas has also undergone, in the meantime, more or less serious changes, so that even an old idea may re-excite the activity of reproduction, and start it developing in a new direction. This is what happens to any one who, after a lapse of years, takes up a book that he once read, or studies observantly and critically the pictures of a gallery which he once hurried through with inattentive mind.

VI.

We have no space to enumerate all the various factors that involuntarily draw our sensory or intellectual attention upon them. Nor can we pause to indicate the means which experience has shown to be best suited to induce a distraction of the attention. We must also pass over the bodily accompaniments of attention, which have recently been made the subject of repeated investigation. In the present state of our knowledge, the fact that an acceleration of pulse or irregular breathing sets in when the mind is

concentrated upon some intellectual employment, cannot be turned to account for a theory of attention. On the other hand, we cannot conclude without raising the question how it comes about that we can offer effectual resistance to distracting stimuli. Our power in this regard is of extreme importance for life in general and for mental development. If our perception and thought and volition depended solely upon the intensity of the stimuli presented to us, we should be at the mercy of external circumstances, and continuous work, any definite and systematic activity, theoretical or practical, would be utterly impossible. We should be like those instable natures who are swayed this way and that way by every breath of opinion; there would be no such thing as acting on principle, no character that could inspire our confidence by wisdom and reliability. Is our theory of the nature of attention strong enough to bear the brunt of a fact like this, a fact of cardinal import for the whole race of man?

How well we are prepared to meet new contents that appear in consciousness depends in very large measure upon the frequency and familiarity of the ideas concerned. The more we have been obliged to occupy ourselves with certain thoughts and experiences, the more firmly do they establish themselves in our minds, and the more easily can they be reproduced and set in motion. At the same time, the simultaneous and successive connections in which the separate contents have been given become by frequent repetition stronger and more certain, and the resulting associative relations more binding and more inflexible. If, now, our susceptibility to external or internal stimuli, to peripheral and central excitations, depends upon our preparedness to receive them, then the whole of the individual's past, with all its associations, will be arrayed in order of battle to meet the scattered assaults of chance. So that, however strong a stimulation may be, still it will lack the power to break into the serried circle of ideas, or at least to hold its ground after the attempt, unless it can make clear its right to entry. What the mental acts and dispositions that we hold in preparation lack in strength is more than compensated by their connection with the permanent tendencies and capacities of the individ-

ual, and by the closeness of the associative bonds in which they are united. Behind the attention, behind distinct consciousness, stands the whole experience of a personality; and it is the nature of this experience that decides what shall excite and fascinate the attention.

Our theory has stood the test. Nay, more, it demands that apperception shall be rooted deep in the thought and volition of an experiencing subject. Circumstances do not rule us, but we confront circumstances,—choosing, arranging, and directing. Our mind is not the sport of incalculable accident; but according to the measure of the strength that is in us, the strength that manifests itself in attention, we can transcend the limits of our organism and help to mould the universe, propounding and realising ideal ends. We do not stand in the mere course of events, indifferent transmitters of mechanical processes; we prove our independence and our freedom by rational test and consideration of the impressions that pour in upon us, and by consistent devotion to the plans and tasks that our conscience has approved. But, we must remember, this power that manifests itself in attention and makes it the mirror of the whole personality is not acquired at haphazard. Education, —the education that we have received or have wrought out for ourselves, decides how well the ideas are prepared which we have to cast into the balance for attentive observation or recollection, for constructive work of imagination or understanding. If there is anything plastic in the mind and its capacities, it is surely the attention,—whose first original fickleness and uncertainty must be trained to constancy and steadiness, and whose unlimited susceptibility to all that can interest man must not be suffered to degenerate into an uncritical surrender to each and every impression, useful or harmful, seasonable or unseasonable, good or bad. We must, then, set to work betimes to ensure the right preparation for apperception. Thus equipped, we shall issue as conquerors from our battle with the changes and chances, the burdens and temptations of life.

O. Kuelpe.

Würzburg.

THE PROBLEM OF CONSCIOUSNESS.

COMMENTS ON PROFESSOR MINOT'S DUALISM.

AT the last meeting of the American Association for the Advancement of Science, the retiring President, Prof. Charles Sedgwick Minot of Harvard University, delivered the usual presidential address before a large and select audience in Carnegie Hall, Pittsburgh, Pa., and his subject was "The Problem of Consciousness in Its Biological Aspects." The speaker was a white-bearded gentleman of dignified appearance with a somewhat dreamy eye. He had an engaging presence, and a distinct consciousness of his authority.

The speech was characterised by a vehement attack on Monism. Professor Minot said:

"Monism is not a strong system of philosophy, for it is not so much the product of deep and original thinking as the result of a contemporary tendency. It is not the inevitable end of a logical process, because it omits consciousness, but rather an incidental result of an intellectual impulse. Its very popularity betokens its lack of profundity, and its delight in simple formulæ is characteristic of that mediocrity of thought which has much more ambition than real power and accepts simplicity of formularisation as equivalent to evidence. It would seem stronger, too, if it were less defended as a faith. Strong partisans make feeble philosophers.

"Monism itself is postulated chiefly upon the two greatest discoveries of the nineteenth century—the law of the conservation of energy, and the law of the evolution of species. Both laws establish a greater unity in the phenomena of the universe than mankind had previously been able to accept. In the physical world, instead of many forces, we now recognise only one force, which assumes various forms of energy; and in the living world we recognise one life, which manifests itself in many types of forms. With these two unities in mind, what could be nearer than the thought that the unity goes still deeper, and that the phenomena

of the inanimate or physical, and of the living world are fundamentally identical? The progress of physiological science has greatly increased the impetus towards the adoption of this thought as the cardinal dogma of the new faith, because the work of physiologists has been so devoted to the physical and chemical phenomena of life, that the conviction is widespread that all vital phenomena are capable of a physical explanation."

Now I do not know any biologist of standing who either is not a monist, or at least does not carry on his investigations with methods along monistic lines of thought. In fact, most of our naturalists and even philologists are monists; and there are almost as many kinds of monism as there are original thinkers: the philologist F. Max Müller's monism is radically different from Haeckel's, and Professor Wundt's is different from either.

In rejecting the monistic conception of consciousness, Professor Minot should at least have indicated whose monism he combated, and he would have been wise to explain and refute either Wundt or Hering or some other monist of unequivocal standing.

I would find no fault with Professor Minot for cherishing and professing dualistic views, but it seems unwarranted and improper to use for his tirades the occasion of a presidential address, which ought to be a representative condensation of the present state of his science. But the most objectionable feature of his address is its lack of positive information. And while Professor Minot is very decided in his censure, his own theories are vague and an explanation of the problem of consciousness is nowhere forthcoming. On account of its barrenness, the lecture does not deserve mention of any kind, and would have been ignored had it not been for the prominence that naturally attaches to the presidential address of a great association with scientific pretensions, the rank of the lecturer as professor in one of our most celebrated universities, and its prominent appearance in *Science* and in the *Popular Science Monthly*.

Professor Minot promised to discuss the problem of consciousness in its biological aspect, but he does not even allude to one single biological fact that would help us to understand better the functions of consciousness. Biology is only referred to in general terms and the statement is made that:

"The biologist must necessarily become more and more the supreme arbiter of all science and philosophy, for human knowledge in itself is a biological function, etc."

I should like to see Professor Minot use his biology as a criterion for the solution of an algebraic equation, or a question of historical evidence, or for the interpretation of a ἅπαξ λεγόμενον in a cuneiform inscription, or apply it to the theory concerning the motions of the stars in the milky way, or to the speculations as to the origin of motion or the ultimate constitution of the chemical elements. I do not think that I have ever underrated the importance of biology, but if Professor Minot be right his colleagues had better abandon the study of chemistry, philosophy, philology, history, mathematics, etc., and apply themselves to biology, though I fear that on these lines the science of the future would become somewhat one-sided.

But let us hear what Professor Minot has to say on consciousness. He sets out with the following considerations:

"The time is not yet for giving a satisfactory definition of consciousness, and we must fain content ourselves with the decision of the metaphysician, who postulates consciousness as an ultimate datum or concept of thought, making the brief dictum *cogito, ergo sum* the pivot about which his system revolves. I have endeavored vainly to discover by reading and by questioning those philosophers and psychologists whom I know, some deeper analysis of consciousness, if possible, resolving it into something more ultimate.

"Opinions concerning consciousness are many and often so diverse as to be mutually exclusive, but they may be divided into two principal classes. The first class includes all those views which make of consciousness a real phenomenon; the second, those views which interpret it as an epiphenomenon. We are, I think practically all, agreed that the fundamental question is: Does or does not consciousness affect directly the course of events?—or, stated in other words, is consciousness a true cause? In short, we encounter at the outset the problem of free-will; of which more later."

Almost every sentence contains a wrong contrast and betrays a lack of logical clearness. It is a fair sample of the Professor's mode of thought; but we cannot lose ourselves in details, and so forego analysing it.

Monism is made responsible for the theory that consciousness is an epiphenomenon:

"The opinion that consciousness is an epiphenomenon has gained renewed prominence in recent times, for it is, so to speak, a collateral result of that great movement of European thought which has culminated in the development of the doctrine of monism."

And what is an epiphenomenon? Here is Professor Minot's explanation:

"It is essential to have a clear notion of what is meant by an epiphenomenon. Etymologically the word indicates something which is superimposed upon the actual phenomenon. It designates an accompanying incident of a process which is assumed to have no causal relation to the further development of the process. In practice it is used chiefly in regard to the relation of the mind or consciousness to the body, and is commonly employed by those philosophers who believe that consciousness has no causal relation to any subsequent physiological process."

In using the term epiphenomenon Professor Minot obviously refers to the Fechner-Weber theory of parallelism between consciousness and nervous activity, but his *résumé* is so misleading as to be almost beyond recognition. And what is his own result? First he states:

"The most striking distinction of the processes in living bodies, as compared with those in inanimate bodies, is that the living processes have an object,—they are teleological."

And he concludes:

"In order to determine the teleological value of consciousness, we must endeavor to make clear to ourselves what the essential function is which it performs. As I have found no description or statement of that function which satisfied me, I have ventured, perhaps rashly, to draw up the following new description:

"The function of consciousness is to dislocate in time the reactions from sensations."

This determination of the function of consciousness is as stilted as it is futile. It appears that Professor Minot confuses consciousness with memory and describes how former sense-impressions are awakened by similar present sensations. Here is his more explicit explanation:

"Consciousness may evoke a reaction from a remembered sensation and combine it with sensations received at other times. In other words, consciousness has a selective power, manifest both in choosing from sensations received at the same time and in combining sensations received at different times. It can make syn-

chronous impressions dyschronous in their effects, and dyschronous impressions synchronous. But this somewhat formidable sentence merely paraphrases our original description: The function of consciousness is to dislocate in time the reactions from sensations."

The process to which Professor Minot refers is not at all exclusively a function of consciousness. Every sense-impression leaves a trace of a definite form. When a new sense-impression of the same kind is made, it travels on the path prepared by the former sense-impression and reawakens its memory trace. This process is the common type of sense-activity which becomes possible on account of the retention of old traces,—a condition which is called memory. It may take place consciously or unconsciously, but there is nowhere in this process "a selecting power" of consciousness; no choosing takes place, and the dislocation in time which changes synchronous into dyschronous impressions and *vice versa* is (so far as the choosing is concerned) a mechanical combination of the same or similar features of new and old sense-impressions. Sensations travel in the paths prepared for them by analogous prior sensations, as in the type-distributing machine the several letters travel to their respective places.

It betrays a lack of the most elementary knowledge of consciousness that the description of consciousness as a dislocator is the sum-total of Professor Minot's wisdom. He harps on the same string again and again, insisting upon the importance of the idea. He declares:

"This disarrangement and constant rearrangement of the sensations, or impressions from sensations, which we gather, so that their connections in time are altered seems to me the most fundamental and essential characteristic of consciousness which we know."

He repeats himself, saying:

"The characteristic we are considering is certainly important, and so far as the available evidence goes it belongs exclusively to consciousness."

And further down he goes into details:

"Thus, for example, the child sees an object, and its reaction is to take hold of the object, which is hot and hurts the child. Later the child sees the object again and its natural reaction is to take hold of it again, but the child now reacts

differently because its consciousness utilises the earlier as well as the present sensation: the previous sensation is dislocated in time and fused with the present sensation and a new reaction follows."

That which is true in all this is trivial, but whether true or not, it sheds no light on the biological function of consciousness. At the same time Professor Minot's style is vitiated by expressions which imply that consciousness is something apart from other mental functions, for consciousness is represented as selecting, as choosing, as utilising, etc. Does Professor Minot really think that there is a consciousness in itself? It seems incredible, but it may be that when he denounces monism for denying the existence of consciousness, he means to say that the monistic view knows only mental states that are conscious, but does not recognise the independent existence of consciousness as an entity in itself. Professor Minot does not expressly state it, so I leave the question undecided.

Professor Minot further makes a few incidental remarks from which we quote the following sentences:

"The evidence is overwhelming that animals have a consciousness homologous with the human consciousness....

"Conscious actions are primary; reflex and instinctive actions secondary....

"Human evolution is the continuation of animal evolution, and in both the dominant factor has been the increase of the resources available for consciousness....

"Consciousness stands in immediate causal relations with physiological processes."

Finally Professor Minot winds up with the following consideration:

"Probably no question is so profoundly interesting to all mankind as the old question, what is the relation of the mind to the body? It is a question which has been stated in many forms and from many points of view, but the essential object of the question is always the same, to ask whether consciousness is a function of living matter, or something discrete and not physical or material."

And here is the Professor's answer:

"Consciousness has the power to change the form of energy, and is neither a form of energy nor a state of protoplasm."

This is practically all he has to say on "consciousness in its biological aspects."

Professor Minot's use of the terms "power" and "energy" is very loose and therefore the last quotation (which declares that consciousness "has power" although it is not "energy") must not be taken too seriously and certainly not literally.

Now I would like to discuss the problem of consciousness as I think it ought to be treated, but having tired my readers with an exposition of Professor Minot's views I feel that I had better limit myself to a few comments on his two bugbears—Monism and Epiphenomenon.

Monism according to Professor Minot must be a very mischievous idea and it seems a great misfortune that it has found much favor, not with the masses (for monism is by no means a popular theory), but with naturalists, the leaders in the realm of science.

Let us see what monism[1] has come to stand for.

Monism means the doctrine of unity, and there are different kinds of monism according to the standpoint chosen by different thinkers. There is a spiritual monism, there is a dynamic monism, there is a materialistic monism. Further there are combinations of the three and the agnostic monism. Büchner's monism recognises matter and force, Fechner's the parallelism of soul and body, etc. All these monisms seek the unity of the world in the assumption that there is one substance only. My own monism is different, as I seek the unity of existence not in the material of which it consists but in its mode of existence. I look upon all reality as one great system and upon all our concepts as abstract ideas, which the more general they are will prove to be more void of content. All of them have ultimately been derived from experience. Knowledge is a *description* of things or conditions; and if the description is appropriate so as to allow us to predict or even predetermine the course of events (if thought and thing tally), we call our description true. I cannot enter into further details, but the applications of this fundamental principle are manifold and important.

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[1] The word was coined by Wolf, but it came into general use only in the latter half of the nineteenth century.

It implies that there are no things-in-themselves. There is no matter-in-itself, no energy-in-itself, no soul-in-itself, no consciousness-in-itself, no memory-in-itself. Consciousness (like whiteness) is a generalisation which is used to denote the characteristic quality of those various conditions that are conscious. Memory is not a faculty, but a general characteristic of mental life. It is an abstract term comprehending in one word the peculiarity due to a preservation of the traces which all physiological activities leave. Accordingly monism (as I understand it) means that all truths, if rightly understood, will form one great system of truths. There may be a contrast, but there will never be a contradiction. Dualism can have two contradictory truths. As the schoolmen said, a statement may be true in philosophy and untrue in theology, and *vice versa*. Monism does not reject the duality of contrasts, but endeavors to reconcile them in a higher unity. There can never be two contradictory truths, and whenever two truths seem to be contradictory, we have a problem.

Monism accordingly is not so much a ready doctrine as a plan of work, a method; and I need scarcely add that this method has proved very fruitful in the history of science. It has stimulated all the natural sciences, especially physiology, psychology, and also Professor Minot's science, biology, but the progress of the age seems to be barred out from his laboratory. It did not enter there and the professor has profited little by it.

In conclusion I have to add a few comments on the term epiphenomenon, which has been adopted by a few modern psychologists to denote consciousness as a phenomenon superadded to physiological brain-processes. The original use of the word is limited to medical nomenclature and means simply "a secondary function"; but when the non-mechanical and non-material quality of consciousness became fully understood, some physiological psychologists introduced the term to emphasise the fact that consciousness is a function radically different from brain-activity and thus they spoke of it as superadded to cerebral motions, being a phenomenon *sui generis*, which according to conditions not yet understood appears and disappears, but is itself not a motion, not a

mechanical process, not a material substance, and in order to give it a name, they called it an epiphenomenon in contrast to the phenomena of the objective world which are modes of matter in motion.

I myself have never used the term "epiphenomenon," and am therefore free to condemn it without compromising myself. I never liked the term because it seems to indicate that consciousness is incidental and its presence or absence would be of no account. This of course is not so, although there are psychologists who have taken that stand. I believe it was Huxley who went so far as to compare consciousness to the sparks thrown out by a steam-engine which give a little light but have no power to alter the movements of the engine; may be it was some other naturalist. For our present purpose, it matters not who it was, so long as it was not a confessed monist, and Huxley is an agnostic; he takes a position which though practically opposed to dualism would neither deny nor affirm its principles or main tenets. The idea that consciousness is an indifferent phenomenon has been emphatically rejected by Hering, Wundt, Ribot, and also by myself. But while the paramount significance of consciousness must be acknowledged, the statement remains true that consciousness is not a brain-motion but a superadded phenomenon; it is an accompaniment of certain physiological processes, being the subjective phase of certain objective phenomena. If the term epiphenomenon is used in this sense, it is quite proper to speak of consciousness as an epiphenomenon. We need some term for it, and epiphenomenon (if it be only commonly accepted) will do as well as any other word. Prof. C. Lloyd Morgan, in order to distinguish consciousness from motion or kinesis, calls the realm of the subjective "metakinesis"; and Professor Minot, in declaring that "consciousness is not a form of energy," sides unknowingly with that large party of monists so vigorously condemned by him who call it an epiphenomenon, or metakinesis, i. e., a function not belonging to that set of phenomena which are modes of matter in motion.

If consciousness is not a motion, it is obvious that it cannot move. Accordingly consciousness (if it is not a form of energy)

can neither push nor pull, and this is the import of the simile in which it is compared to the sparks of the steam-engine. The simile is inappropriate, as might be expected of a simile, for says the Roman proverb *omne simile claudicat*. Even Professor Minot is sometimes extravagant in his comparisons. He says for instance:

"All science belongs in the same category as the teleological efforts of a jelly fish or a lobster. It is work done at the command of consciousness to satisfy the needs of existence."

I am far from denying what Professor Minot means, but his humility seems to me exaggerated when he classifies his professional work in the same category with "the efforts of a jelly-fish or a lobster."

If we take the simile of the spark-throwing engine *cum grano salis*, it remains perfectly true; but I should prefer to compare consciousness to the light in an engine-room which has no visible effect upon the mechanical motions either of the engine or of the muscles of the engineer; but merely reflects the picture of the surroundings upon the retina of the engineer's eye, thus enabling him to see the wheels and levers and assisting him in directing the movements of the machinery. Even this simile is inaccurate, as (in the widest sense of the term) the ether waves of light are also mechanical; but, if not wilfully misunderstood, it will help to explain the rôle of consciousness in its paramount importance and at the same time its utter want of mechanical power. Thus we recognise the truth of what Professor Minot tries to express in his paradox that consciousness "has the power to change the form of energy, but it is not a form of energy itself."

Consciousness is an abstract term, like whiteness or transparency, or any other generalisation. The quality of consciousness that is attached to a nervous state does not add an iota of mechanical power to it, but it modifies its character so as not to be an irrelevant factor in the economy of the mind. Consciousness, though not itself a motion, is the most significant feature of existence. And here is the point where I would shake hands with Professor Minot and forgive him his superficiality and lack of scientific insight. He is groping after an important truth, but he is

groping in the dark. His heart is probably on the right track, but the mechanism of his logical operations got somewhat out of gear and threw him off the track, and not knowing where to lay the blame of his confusion, he rails at the doctrine of monism which he has proved unable to comprehend.

Professor Minot thinks that monism "involves the elimination of the two concepts God and consciousness," and he adds that "monists sometimes use these words, but it is mere jugglery, for they deny the concept for which the words actually stand." May the God of monism forgive Professor Minot for his blasphemous utterances. May He who is the underlying norm of the cosmic order, the omnipresent principle of the so-called laws of nature, the eternal standard of truth, and the ultimate condition of all correct thinking,—He who is the most real reality of all actual as well as potential existence, and not mere jugglery,—may He, the God of Science, take compassion upon the confused condition of Professor Minot's brain. May he illumine his mind. May He who is One and co-eternal with the Logos forgive him his lack of logic and other failings and lead him gently on the path of science to a deeper and better comprehension of the truth. Amen.

EDITOR.

SKETCH OF THE ORIGIN AND DEVELOPMENT OF GEOMETRY PRIOR TO 1850.[1]

ALL phases of culture are so interconnected that it would indeed be in vain to study any branch of history, beginning with a determinate epoch, without throwing a glance over anterior times and events.[2] If this historical maxim is difficult to confute with regard to any one of the sciences known to us, it seems endowed with irrefragable truth when applied to a discipline so conservative as mathematics, which does not destroy the labors of preceding periods to construct in their stead new edifices.[3] Consequently before entering upon the subject proper of this history, that is, before speaking of modern geometry, we will examine briefly the origins of our science and the stages of development it passed through before reaching the state beginning with which we propose to study minutely its development.

1. To determine and historically demonstrate the first origin of geometrical research is a question which we should attempt in vain to resolve,[4] because no written document enables us to be present at the awakening and first stammering of the human intelligence. The every-day experiences of any intelligent person lead in so natural a manner to the conception of the simplest geometrical forms, and to the consideration of their mutual relations,

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[1] Translated from the Italian of Loria by Dr. George Bruce Halsted.

[2] Libri, *Histoire des sciences mathématiques en Italie*, I (Paris, 1838), p. 3.

[3] Hankel, *Die Entwickelung der Mathematik in den letzten Jahrhunderten* (2. Aufl., Tübingen, 1885), p. 7.

[4] This is treated from the psychological point of view in Book I. of the *Histoire des mathématiques* of Hoefer (2d ed., Paris, 1879), which we cite because curious, not to give assent to the ideas there maintained.

that we should seek in vain to assign the epoch of the birth of geometry, and still less are we able to cite the man to whom belongs the honor of having first cultivated this noble discipline. The information which the ancients have transmitted to us on this point is so uncertain, vague, and untrustworthy, that, if not complete darkness, certainly only glimmering light meets him who proposes to explain how and why geometry entered to make part of the field of investigation for thinkers; nay such light is so scarce that it only permits us to see the outlines of certain fragments of greater mass, which have withstood the injuries of time. What these are and what value they possess we will now briefly tell, occupying ourselves successively with the various peoples that in most remote antiquity reached a stage of civilisation sufficient to permit the study of pure science.

We shall not speak of the Etruscans, in the first place because the information relative to the geometrical thought of a people whose language is even now an enigma for philologists is, if not null, certainly very slight, and in the second place because it seems certain that they exercised influence only on the Romans, who were started and directed by them in geodetic research (see § 6). If we are equally silent about the Hindoos, it is because not being able to determine with certainty whence came the information about them which we now have at our disposal, we have no right to speak of a Hindoo geometry more ancient than and therefore independent of the Greek Geometry, with which shortly we shall be occupied. In the same way we shall deal with the Chinese; for who could ever be sure that the geometric knowledge (in any case very limited) possessed by them was not imported from abroad and then declared national property by a people whose vanity is such that even to-day it boasts of having reached in the most remote antiquity inventions at which other nations have with difficulty arrived in recent times?

The people which had its original home on the banks of the Tigris and Euphrates is held to be the first of all to cultivate Arithmetic and Astronomy. Often also, among the Assyrians and Babylonians, one can trace some knowledge of geometry, a science

toward which they felt themselves drawn by the hope of being able to apply it to foretell the future; and it is perhaps from their having labored with *geomancy* that they were led to consider, as they did, parallels, triangles, and quadrangles, to seek for methods to practically construct right angles, to divide the circumference of a circle into 6 and 360 equal parts, to determine an approximate value for the ratio of the circumference of a circle to its diameter.

2. Of far more importance for us than the people just mentioned were the inhabitants of the banks of the Nile, for the Greeks, who are without doubt to be considered our scientific progenitors, declared themselves, and were in fact, debtors to them for the foundation on which they erected their geometric edifice. Herodotus, who travelled in Egypt about 460 B. C., asserts that geometry had its origin in that country when King Sesostris divided equally among his subjects all the arable land in his realm; adding that a very powerful impulse for occupying themselves with geometry was given the Egyptians from the necessity to restore every year the boundary lines between the various properties, which lines the Nile obliterated during its periodical inundations. It is therefore not surprising to find that also Isocrates, about 393 B. C., declares the study of geometry was recommended to the Egyptian youth. In a similar manner Plato and Aristotle, Diodorus Siculus and Heron of Alexandria, Strabo and Democritus express themselves; nay, this last author, to show his own geometric ability, finds nothing better to assert than: "In the construction of lines by means of conclusions drawn from hypotheses, no one has surpassed me, not even the so-called ἁρπεδονάπται of the Egyptians." Who these "harpedonaptai" were is not known with absolute certainty, yet the hypothesis of M. Cantor[1] seems to us quite plausible. According to him their name (rope-stretchers) was derived from its having been their principal duty to construct in practice right angles, which they did by forming into a right triangle a rope divided into three parts respectively 3, 4, and 5 units in length.

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[1] *Vorlesungen über Geschichte der Math.* (Leipsic, 1st ed., 1880, Vol. I., p. 55, 2nd ed., 1894, p. 64).

The practical origin assigned to geometry by Herodotus, the special operation assigned to the "harpedonaptai," and the existence in Egypt of huge and wonderful architectural and hydraulic works, lead us to believe that the geometry of the Egyptians had a particular tendency towards applications, and this supposition is strengthened by the examination of a very important written document which we possess, regarding the mathematics of this people. We allude to the *Manual of the Calculator* preserved for us in the now celebrated Papyrus Rhind, written by a certain Ahmes 17 or 20 centuries B. C.[1] Unfortunately this writing, while offering a large mass of matter concerning the ancient methods of calculation, gives scant information regarding the geometric knowledge possessed by the inhabitants of the land of the Pharaohs, for geometry is not treated there *ex-professo*, but certain rules, given for evaluating surfaces and volumes, are tacitly applied to illustrate arithmetical procedures. In this *Manual* are found therefore only a few traces of metric geometry, upon the value of which there is not perfect agreement among the various historians.[2] Thus it seems indisputable that the Egyptians knew how to calculate the area of a square, but it is not certain that they knew how to do the same for a rectangle, and still more doubtful if they were able to measure with exactness the area of a triangle or a trapezoid. Again they make a circle equal to a square whose side is 8/9 of the diameter, which is the same as assuming $\pi = (16/9)^2 = 3.1604$,—a fair approximation. As for the rules by which they measured the capacity of certain granaries, it is impossible to judge, the form of these not being told; however it helps decidedly to suppose that certain problems concerning the pyramids were solved by them by a special calculus[3] presumably analogous to that which to-day we use in availing ourselves of the notions of *sine* and *tangent* of an

[1] A. Eisenlohr, *Ein mathematisches Handbuch der alten Aegypter* (Leipsic, 1st ed., 1877, 2nd ed., 1891).

[2] See besides the works already cited: E. and V. Revillout in *Revue Égyptologique*, 2, 1881, pp. 304–314, and Em. Weyr, *Ueber die Geometrie der alten Aegypter* (Vienna, 1884).

[3] M. Cantor, "Ueber den sogenannten Seqt der alten Aegypter" (*Wiener Ber.*, 90, 1884).

angle. It is seen therefore that the geometry of the ancient Egyptians offers several obscure points, to clear up which would require recourse to other documents, but these are either still unknown or have not yet been deciphered.[1] Meanwhile, until it has been demonstrated that the Egyptians knew how to explain the geometric rules applied by Ahmes, we feel authorised to deny to the collections of geometrical facts which they possessed the character of a true science.

3. Such conclusions have importance principally because (see § 1) they exempt us from treating the question of the nature and extent of the foreign influence on Greek geometry.[2] In fact, admitting that the Babylonians and Egyptians had communicated to the Greeks all their geometric knowledge, these would in consequence have received from them only a very small amount, and certainly not the stimulus to mathematical research; moreover this is confirmed by the unity of direction in the evolution of all the Greek geometry, a unity which would be with difficulty explained by one considering it as a tree transplanted from a foreign land.

The person by whose initiative in Greece the torch of science is lighted and glimmers fitfully, is Thales of Miletus.[3] To him we are debtors for the transportation into Europe of the germs of the exact sciences, and for the first attempts to cultivate them. If to him and to his followers (the members of the Ionic school) we cannot assign any important mathematical discovery, it is because the indisputable tendency toward physical research which Thales possessed became so pronounced in his disciples and successors (Anaximander and Anaximenes) that these came to disregard the investigations of pure mathematics. Thales and the Ionic school

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[1] Cantor, *Vorlesungen*, 1 (2nd ed.), p. 23.

[2] As is known, the analogous question for the other disciplines and especially as to philosophy is extremely controverted: see Zeller, *Die Philosophie der Griechen* (Leipsic).

[3] Further particulars concerning the geometers of whom the present paragraph treats (specially as to the relative chronological determinations) will be found in the monograph by the author: *Le scienze esatte nell' antica Grecia*, Libro I, *I geometri greci precursori di Euclide* (*Mem. della R. Accademia di Modena*, II., 10, 1893).

represent therefore, in our opinion, the twilight, preceding the dawn of Greek mathematics.

But the sect of Ionic physicists having disappeared, another man arises and founds another school, Pythagoras and the Italic school, in which it seems reasonable to place the fountain-head of the majestic river of geometric research. In fact, in it, with the stable systematisation attained by the theory of ratio and of proportion, the study of the problems of the "applications of areas" and the introduction of irrational quantities, were prepared the instruments which came afterwards to be continually used by the most eminent of the ancient geometers, and to which must always recur whoever intends to follow their luminous footsteps.

The destruction of the Pythagorean community did not extinguish the enthusiasm for mathematics among the admirers and followers of the philosopher of Samos; certainly we find in Hippocrates of Chios and Archytas of Tarentum, late disciples of Pythagoras, two strenuous workers in the research of geometric truth. Nor did the other philosophical sects which were afterwards so numerous in Greece remain indifferent to the progress of exact science: this is shown by what we know respecting Zeno and Democritus, Anaxagoras and Hippias, Plato and Aristotle, and the phalanx of thinkers who were instructed or directed by these.

Thanks to the co-operation of so many great geniuses, there was laid so solid a foundation for the geometric edifice, that more than one judged that the time had come to organise into a body of doctrine the results of the investigations accomplished. Besides were studied thoroughly the three famous problems, the quadrature of the circle, the duplication of the cube, and the trisection of the angle, which gave opportunity (to Archytas, Eudoxus of Cnidos, and Deinostratus), for inventing important new lines plane and of double curvature. Moreover there were discovered and coordinated by Aristæus the Elder, the properties and various applications made of those curves which Menæchmus discovered and Kepler was later to recognise as the trajectories of the planets; finally the conception of infinity makes timidly its ingress into mathematics, where it was destined to occupy later a position of

exceptional importance. At the same time also the methods of research and exposition of geometric truth were made objects of accurate study;—we arrive thus at the *method of reduction* due to Hippocrates, the *analytical method* formulated by Plato, the *method of exhaustions* so brilliantly applied by Eudoxus. On the other hand by introducing the diorism Leon points out an important complement required in the solution of any problem; while by determining the conditions of invertibility of a theorem, Menæchmus teaches a fruitful method for deducing from one proposition, others. Moreover, logic which is joined to mathematics by so many intimate bonds, received powerful impulses from dialectics, from the sophists, and from the teaching of Socrates; it was in consequence so conspicuously perfected, that Aristotle thought the moment had come to expound its fundamental canons in a work which afterwards remained a classic for long ages.

4. From this appears how everything seemed to conspire to the emergence of a period of singular bloom for geometry, and in fact this did not delay its coming; this falls within the Græco-Alexandrine epoch and, compared with the periods preceding and following, merits the name of *golden period of Greek geometry*, by which we choose to designate it. To make a completely faithful picture of it is to-day an impossible undertaking,[1] since only a few persons of that epoch can be portrayed with exactness; of others we perceive only a few outlines, of still others we know the existence, but are not able to descry the lineaments and contour. However, what we know enables us to assert that, just as Greek philosophy in the period of its most dazzling splendor found in Socrates, Plato and Aristotle its most conspicuous representatives, so in the golden period of Greek geometry tower gigantic Euclid, Archimedes, and Apollonius. Through the merit of the first of these geometers the civilised world came into possession of a wisely arranged collection of the most essential properties of figurate space, a collection which throughout centuries and centuries was consid-

[1] See G. Loria, *Le scienze esatte nell' antica Grecia*, Libro II, *Il periodo aureo della geometria greca.* (*Mem. della R. Accad. di Modena*, II, 11, 1895).

ered a code of insuperable value and which always inspires admiration and respect even in those who do not blindly accept its arrangement and precepts. The second—Archimedes—founder of the family of Italian geometers, organiser of the higher metrical geometry, precursor of Leibnitz and Newton—reveals himself to us as of such marvellous fecundity in devising expedients to solve, entirely without the aid of the concept of infinity, a number of questions which to-day are regarded as strictly pertaining to the infinitesimal calculus, that the study of these still fills us to-day with astonishment and makes us sadly ask ourselves whether the invention of general methods which has so much exercised modern scientists has not perhaps dried up the source of ingenious expedients. Less vivid and spontaneous does the admiration arise in one who contemplates the works of Apollonius, because we are so identified with the present methods of research, quick and general, that with difficulty can we appreciate how great a mass of work was required in reaching the truth without invoking their aid; thus we can hardly defend ourselves from a sense of surprise which retards the enthusiasm; but when we attain this we come to justify those who consider Apollonius the greatest geometrical genius that the world had seen before Steiner.

The united efforts of these three great mathematicians, of their contemporaries or immediate successors, (among whom we name Hypsicles of Alexandria, Diocles, Nicomedes, Perseus, and Zenodorus), established an impregnable foundation for the whole geometric edifice, prepared the ground for the infinitesimal calculus and increased immeasurably the sphere of influence of geometry by bringing within its confines new and most interesting geometric forms. These led to numerous solutions of the problems (already famous in the pre-Euclidean period) of the duplication of the cube and the trisection of the angle, and taught geometers to consider that of the quadrature of the circle from the only point of view which—with the algebraic knowledge of the epoch—then permitted a solution. Moreover these laid the foundation of the geometric study of maxima and minima, and particularly of the doctrine of isoperimetry. Lastly by furnishing the most important elements

of that celebrated didactic aggregate which goes by the name of *locus resolutus*, they employed themselves in paving the way for future investigators, striving thus that the spirit of geometric research should not die with them.

5. The list of great names which Greek mathematics vaunts would present an unpardonable gap if it did not mention Heron of Alexandria and Claudius Ptolemy.[1] The scientific work of the former was specially geodetic and that of the second, astronomic; this makes Heron appear as the most ancient Greek writer on geodesy, and establishes his close connection with Ahmes (see § 1), but his work can be estimated with slight exactness and great difficulty on account of the present condition of the manuscripts, which are blemished by omissions and corrupted by additions of doubtful value made by anonymous commentators;[2] on the contrary the achievements of Ptolemy can be judged because his most important work—the *Mathematical Composition* (*Syntaxis Mathematica*) or *Almagest*—has reached us (by way of the Arabs) complete, and presents to us a treatise of spherical trigonometry accompanied by important chapters on plane trigonometry and founded in part on the theory of transversals for plane and spherical triangles, of which the geometer Menelaus of Alexandria had previously laid the foundations.

After the great thinkers mentioned in this and the preceding paragraph, for many intrinsic and extrinsic reasons, which this is not the place to discuss, the love for geometric research seems to grow cold among the Greeks, or at least the power to accomplish it disappears; then begins the epoch of the commentators, which we choose to call by the name of *silver period of Grecian geometry*.[3]

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[1] Cf. G. Loria, *Le scienze esatte nell' antica Grecia*, Libro III., *Il substrato matematico della filosofia naturale dei Greci* (*Mem. dell' Accademia di Modena*, 1900).

[2] The recent discoveries of the Μετρίνα made in a manuscript now at Constantinople and the complete edition of the works of Heron which is now being prepared lead us to hope that soon upon this scientist also we shall be able to pronounce a definite judgment.

[3] Cf. G. Loria, *Le scienze esatte nell' antica Grecia*, Libro IV., *Il periodo argenteo della geometria greca* (*Mem. dell' Accademia di Modena*, 1900).

To this appertain Eutocius and Proclus, whom we gratefully remember on account of the numerous and important points of information which they preserved for us concerning the ancient geometry and the ancient geometers, but who did not carry our science a single step forward; rather we might say that Proclus tried to make it retrograde, when in commenting on Euclid he mixed mathematics and philosophy, as if he wished to replace in honor a system which precisely Euclid, perhaps the first, had with full reason vigorously combated by his example. Neither does Serenus of Antissa or Antinoupolis[1] merit much greater honor, who dealing with the sections of the cylinder incidentally demonstrated that the harmonic relation is projective, nor Theon of Alexandria who edited Euclid and illustrated Ptolemy. But let us bow reverentially to Pappus of Alexandria who brought notable contributions to the works on which he commented in his celebrated *Mathematical Collections*; in it noteworthy additions to elementary geometry are made, new properties of the spiral of Archimedes are pointed out, two new constructions for the Quadratrix of Deinostratus which are extremely noteworthy as being founded on stereometric considerations are demonstrated, and the spherical curve analogous to the spiral of Archimedes is defined and studied, which gave Pappus the occasion for finding the area of a certain portion of the sphere, thus making the first known complanation of an area not plane.

We pass over the additions made to the theory of isoperimeters to record the theorem unjustly attributed to Guldinus (1577–1643) establishing a close relation between the position of the baricenter of a plane figure and the volume which this generates by rotation about an axis; furthermore the numerous relations of segments which are to-day considered as indispensable parts of the theory of harmonic relation and of involution. Does not this suffice to show that the Greek mathematical genius, like a failing lamp, emits, while dying, a beam of resplendent light?

6. On the mathematical stage as prime actor the Roman peo-

[1] See Heiberg, "Ueber den Geburtsort des Serenos" (*Bibl. math.*, 1894).

ple follows the Greek, but its appearance marks an indisputable retrogression.[1] For the Romans, conquerors and legislators of the whole world, seem to have been without any tendency toward research in pure science.[2] Their mathematics, even at the moment in which it most shone, was essentially practical; we could even say that it was only religious and legal.[3] If geometry did not during the Roman epoch fall into complete oblivion, the merit is due to the surveyors, who, however, had no other intention than to reach in their operations an accuracy sufficient for the every-day needs of civil life, and in particular to execute the order of Augustus, who wished to have carried out the ancient project of Julius Cæsar to measure the area of the empire.[4]

The Middle Ages do not afford material for long consideration. The utter darkness which during this period wrapped up all mankind is not pierced by any sprinkling of light derived from any scientist worthy of the name; to prove how low was then the level of mathematical knowledge, it is sufficient to remark that among all

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[1] To confirm this assertion, we cite the following eloquent words of the celebrated historian of Italian mathematics: "....mais bientôt le Romain arrive, il saisit la science personifiée dans Archimède, et l'étouffe. Partout où il domine, la science disparaît: l'Étrurie, l'Espagne, Carthage en font foi. Si plus tard Rome n'ayant plus d'ennemi à combattre, se laisse envahir par les sciences de la Grèce, se sont des livres seulement qu'elle recevra: elle les lira et les traduira sans y ajouter une seule découverte. Guerriers, poètes, historiens, elle les a eus, oui; mais quelle observation astronomique, quel théorème de géométrie, devons-nous aux Romains?" Libri, *op. cit.*, I., p. 186.

[2] Cicero himself recognised this, saying: "In summo honore apud Græcogeometria fuit; itaque nihil mathematicis illustrius; at nos ratiocinandi metiens dique utilitate huius artis terminavimus modum." *Tusc.* I, I., c. II., 5.

[3] To show how the Romans misunderstood the true character of mathematics, suffice it to say that they confounded it with astrology and the sister arts; no wonder then that in the code of Justinian certain laws are collected under the title: *De maleficis et mathematicis et ceteris similibus*, and among them the following: "ars autem mathematica damnabilis interdicta est omnino." See M. Cantor, *Mathematische Beiträge zum Kulturleben der Völker* (Halle, 1863), p. 397; Hankel, *Zur Geschichte der Mathematik im Alterthum und Mittelalter* (Leipzig, 1874), p. 301. It is well to observe also that if during the imperial period we meet some mathematical investigation, its author is some Greek.

[4] It is expressly to the practical part of geometry that the Roman legislator alludes when in the above-mentioned Code he wrote: "Artem geometriae discere atque exercere publice interest." (See Hankel, *l. c.*)

the students of that epoch, Gerbert (d. 1003)—later Pope Sylvester II.—appears a giant, and yet we try in vain to cite some discovery of his in the field of exact science. However, we may note that the numerous sacred monuments erected during the Middle Ages—which according to the genial conjecture of a great poet are so numerous and bold because they represent the only method of expression then conceded to the human intellect[1]—prove that such part of the theoretic science as every architect must have at his disposal was even in those times generally known. But a word of grateful praise must be spoken in favor of the Arabs, who performed the modest, but useful and certainly not ignoble, part of transmitters into Europe of the Hellenic science, nor did they fail to bring to our mathematical knowledge (especially in the arithmetical field) additions and modifications worthy of being honorably mentioned in the annals of our science.[2]

7. This period, so sad for the mathematic discipline, can be said to end about 1200 with the appearance of Leonardo Fibonacci of Pisa (1180–1250 *circa*), able calculator, fine geometer, and genial algebraist; for only when algebra, transported into Europe by this eminent scientist, and his meritorious works had exercised their influence—and to perceive it manifest we must go down to the appearance in 1494 of the *Summa* of brother Luca Paciuolo (about 1445–1514)—commenced a time of extraordinary activity, which Italians mention with legitimate pride, because then that country swayed worthily the mathematical sceptre. But we observe that this period, if it had great importance for analytical research, did not assist in any sensible progress of our geometrical thought. In truth Tartaglia (1500–1557) and Cardan (1501–1576), Scipio Ferro (?–1526) and Lodovico Ferrari (1522–1565), and the other minor geometers of that time have the glory to have contributed effec-

[1] See the admirable chapter entitled "Ceci tuera cela" of *Notre Dame de Paris*, where Victor Hugo writes among other things: "Il existe à cette epoque, pour la pensée écrite en pierre, un privilège tout à fait comparable à notre liberté actuelle de la presse. C'est la liberté de l'architecture."

[2] See Suter, "Die Araber als Vermittler der Wissenschaften in deren Uebergang vom Orient in den Occident." (*XXV. Jahresheft des Vereins schweiz. Gymnasiallehrer*, 1895.)

tively to the foundation and development of the theory of equations, not disdaining to propose and accept the public challenges, which were a noteworthy characteristic of this epoch; but, on the other hand, they transmitted to posterity geometry very nearly as they received it from the Greeks by way of the Arabs. Only we observe that, among the questions dealt with in that epoch by the Italian scientists, some refer to the geometrical constructions to be executed with a single opening of the compasses. This is a conception which is unjustly considered by Montucla as *une bagatelle géométrique*,[1] which is found in Number V. of the challenge problems sent in the celebrated contest between Tartaglia and Ferrari in October, 1547,[2] and which G. B. Benedetti (d. 1590) has unfolded in his work *De resolutione omnium Euclidis problematum aliorumque una tantummodo circuli data apertura* (Venice, 1553) and which gave rise later to *La geometria del compasso* (Pavia, 1797) by Lorenzo Mascheroni (1750–1800)—in which is demonstrated the possibility of solving without a straight edge all the problems of elementary geometry—and, after having been modified, to *Die geometrischen Constructionen ausgeführt mittelst der geraden Linie una eines festen Kreises* (Berlin, 1833) by Jacob Steiner (1797–1863)—a work in which is indisputably demonstrated a fact (that indicated by the title) which, as this great geometer recognises and indicates, had already been pointed out.[3]

8. After the time of the able scientists to whose labors we owe the solution of the equations of the third and fourth degree, the primacy in mathematics was attained by France, especially through the merits of Viète (1540–1603), whose labors for algebra it is not necessary to record here, and whose interest for geometry is shown

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[1] *Histoire des mathématiques.* T. I. (2d ed. Paris An. VII.), p. 570.

[2] For greater particulars see Kutta, "Zur Geschichte der Geometrie mit constanter Zirkelöffnung" (*Nov. Acta Abh. der k. Leop. Carol. Akad.*, 71, 1897). It is sufficient to note that Ferrari himself makes the consideration of such problems go back to a period much anterior; in fact, he speaks of "that fine invention, to operate without changing the opening of the compasses, of which I do not know the origin, but which I know well that many fine geniuses have in the last fifty years worked hard to add to."

[3] Poncelet, *Traité des propriétés projectives des figures* (Paris, 1822) §§ 351–357.

by the construction which he gave for a circle tangent to three others, expounded by him in the form of a restoration, in the work entitled *Apollonius Gallus seu exsuscitata Apollonii Pergaei περὶ ἐπαφῶν geometria* (Paris, 1600). Not long afterwards Mydorge (1585–1647), Pascal (1623–1662),[1] and Desargues (1596–1662)[2] strengthened the supremacy of France by adding to the patrimony of geometry original views, new methods, and new propositions; in fact in *Claudii Mydorgi Conicorum operis* etc. (Paris, 1631–1639) is found, not to mention other things, for the first time the homothetic transformation of one conic into another: from the *Traité général de la Roulette* of Pascal we learn a number of admirable properties of the cycloid, while the applicability of the method of perspective to the study of the conic sections and the celebrated theorem which bears the name of Pascal (although the author had preferred to designate it by that of the "mystic hexagram") are found in the celebrated *Essai pour les coniques;* finally in the *Œuvres de Desargues* (ed. Poudra, Paris, 1864) are found for the first time treated together the three conic sections, the concept of the involution of points is introduced, and its presence demonstrated in the section of a plane quadrilateral with a right line ("transversal"), and not only is perspective applied, but also with great breadth and ability the idea of infinity[3] as a potent auxiliary for the research of the plastic properties of space.[4]

That also in England and Germany geometry had not fallen during this epoch into a complete oblivion is shown by the lectures given at Oxford by Henry Savile (1549–1622), who founded there two chairs of mathematics still in existence, and by the geometric

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[1] See J. Bertrand, *Blaise Pascal*, (Paris, 1891).

[2] S. Chrzaszewski, "Desargues's Verdienste um die Begründung der projectivischen Geometrie" (*Archiv*, II., 16, 1898).

[3] Newton inspired by Desargues wrote: "Lineae parallelae sunt quae ad punctum infinite distans tendunt." *Principia*, Book I., Lemma 22.

[4] To Desargues Poncelet attributes the geometrical method which consists in substituting for a curve a system of straights (*Propr. proj.*, 2nd ed., Vol. II., Paris, 1866, p. 128); but that this attribution, although accepted by many, lacks a solid foundation, I have proved in the note entitled "Desargues e la geometria numerativa" inserted in the *Bibl. math.*, 1895.

researches of John Kepler (1571–1630) to whom we can attribute[1] the concept of the point at infinity of the straight.

9. The greater part of the geometric ideas given and applied by the geometers just cited remained for long years fruitless. They were as if suffocated in the heavy analytical atmosphere which we have already indicated. Yet in the seventeenth century the supremacy of analysis is not yet so manifest as to make geometers forget the problems whose solution they had so long and so earnestly desired; whence it is that then among the tendencies of the epoch and the aspirations of the scientists there arose a contest *sui generis*, by the clash of contradictory opinions was generated a spark, mother of a conflagration destined to illuminate the entire universe[2] and

> "Di cui la fama ancor nel mondo dura
> E durerà quanto il moto lontana:"

—analytical geometry is born.

Although already in some practical proceedings employed by artists and astronomers of Egypt and later by the Roman surveyors, as well as in some methods which were applied by Greek geometers of the first order, such as Heron and especially Apollonius,[3]

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[1] See C. Taylor, *Ancient and Modern Geometry of Conics* (Cambridge, 1881), pp. lvii–lix.

[2] See E. du Bois-Reymond, "Culturgeschichte und Naturwissenschaft" in the collection *Rede*, I., 1886, pp. 207–208.

Concerning the prehistory of analytical geometry see Günther, "Die Anfänge und die Entwickelungsstudien des Coordinatenprincips" (*Abhandl. der Nat. Ges. zu Nürnberg*, 6; compare *Bull. Bonc.*, 10); the conclusions of this work were confuted by Zeuthen in the "Note sur l'usage des coordonnées dans l'antiquité et sur l'invention de cet instrument (*Bull. de l'Acad. danoise des Sciences*, 1888), to which Günther replied in the *Neue philosophische Rundschau*, 1888.

[3] In truth, whoever studies thoroughly the treatise of Apollonius on *Conics* must confess the profound analogy it bears to an exposition of the properties of the curves of the second degree by means of Cartesian co-ordinates; not only do the fundamental properties employed by the Greek geometer to distinguish the three curves one from the other translate into the canonical equations of the same in Descartes's method, but many of the reasonings given, when translated into the ordinary language of algebra, answer to elimination, solution of equations, transformation of co-ordinates, and the like. What we would however seek in vain in the Greek geometer is the concept of a system of axes, given *a priori*, independent of the figure to be studied.

it is easy to see some trace of what to-day we call the system of orthogonal Cartesian co-ordinates; although already the Arabs and the Italian algebraists of the Renaissance had adopted geometric considerations to solve graphically certain equations; although Vieta had already used abscissas for particularising with the help of numbers the points of a straight, and Nicole Oresme (about 1320–1382) had made use more or less explicitly of co-ordinates it seems now settled beyond dispute that Descartes (1596–1650)[1] and Fermat (1608–1655)[2] were the first to see in its whole extent the possibility of representing by means of the symbols of algebra the forms of space constructed according to any law, and to perceive all the advantage which analysis and geometry could derive from their unexpected marriage.[3] Fermat perhaps came before Descartes to the new branch of mathematics, but what he published is of later date than the celebrated *Géométrie* (1637). In this work is given explicit indication of the equation of the curve, and a solution of the problem *ad tres aut quatuor lineas*, so famous among the ancients; moreover the distinction between algebraic and transcendental curves is suggested, and a classification, now abandoned, of the algebraic curves is proposed, by adopting which the curves of the degrees $2n-l$ and $2n$ would be classed in the same *genus*; a method is taught of drawing tangents to plane curves, which later is applied to the conchoid and to the ovals of Descartes; nor is the possibility overlooked of extending to space the method of co-ordinates. On the other hand, in the memoir by

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[1] See Jacobi, "Ueber Descartes's Leben und seine Methode, die Vernunft richtig zu leiten und die Wahrheit in den Wissenschaften zu suchen" (*Ges. Werke*, 7, 1891; see also *Journ. de Math.*, 12, 1847), Arago, *Œuvres Complètes*, 3, Paris, 1855.

[2] Arago, *loc. cit.* See *Œuvres de Fermat* (ed. P. Tannery and C. Henry), 1, (Paris, 1891), 2 (1894) and 3 (1896).

[3] That the *Analysis geometrica, sive nova et vera methodus resolvendi tam problemata geometrica quam arithmetica quaestiones*, by Hugo de Omerique (1634–?), the first part of which appeared at Cadiz in 1698, suffices to make its author seem the precursor of modern analytical geometry (as is affirmed by P. A. Berenguer in the article entitled "Un geómetra español del siglo XVII.," inserted in *Progréso*, 5, 1895), is a yet unsolved question, because for this purpose it would be necessary to know the second part of that work, which has not yet come to light.

Fermat *Ad locos planos et solidos isagoge* (in *Varia Opera*, 1679) the conception of the equation of a curve is more clearly set forth than in the *Géométrie*; besides, the equation of the straight is employed, the general equation of the second degree with two indeterminates is discussed, and the method of co-ordinates is applied to the solution of equations. If we add that Fermat discovered and corrected some errors of Descartes, it will be seen that it is rather by a lucky chance than on account of true merit that the discovery of analytical geometry is regarded as inseparably connected with the name of the author of the *Discours de la méthode*, instead of with that of Fermat.

The facility with which the new mathematical instrument solved problems which had surpassed the powers of the ancients, caused the majority of Descartes's and Fermat's contemporaries and immediate successors to abandon the path opened up by Euclid and by Apollonius; they preferred to enter upon the new road which, on the one hand, appeared smooth and easy to travel,[1] and, on the other hand, attracted them on account of the obstacles with which it was always bestrewn, and which seemed very important to remove. Among these early cultivators of analytical geometry are conspicuous J. Wallis (1616–1703) for his *Tractatus de sectionibus conicis nova methodo exposita* (1655), Florimond de Beaune (1601–1652), and Franz van Schooten (?–1661) thanks to their commentaries on Descartes, and still more Johann De Witt (1625–1672) for his *Elementa curvarum linearum* (1658).

10. The modes of procedure of mathematical investigation founded on the methodical use of the infinite and the infinitesimal, applied by Archimedes in antiquity in a peculiar manner and prepared many centuries later by Kepler's *Stereometria doliorum* (1615) and the *Geometria indivisibilibus, etc.* (1635) of Bonaventura Cavali-

[1] "Ainsi, à certaines époques, où, après de grands efforts, les sciences mathématiques semblent avoir épuisé toutes les ressources de l'esprit humain et atteindre le terme marqué à leurs progrès, tout à coup une nouvelle méthode de calcul vient s'introduire dans ces sciences et leur donner une face nouvelle. Bientôt on les voit s'enrichir rapidement par la solution d'un grand nombre de problèmes importants dont les géomètres n'avaient osé s'occuper, rebutés par la difficulté." Condorcet in his *Eloge de M. Euler*.

eri (1598–1647), by the methods of constructing tangents to curves imagined by Descartes and by those which Fermat suggested for the research of maxima and minima,[1] finally by the investigations of Roberval (1602–1675)[2], of Torricelli (1608–1647, *Opera geometrica*, 1664)[3] of Gregory St. Vincent (1584–1667) (*Opus geometricum*, 1647), of Wallis (*Arithmetica infinitorum*, 1655), of Pascal, etc., and invented, soon after the appearance of the *Géométrie* of Descartes, at the same time by Leibniz (1646–1716)[4] and Newton (1642–2727),[5] emphasised the tendency characterised in the preceding section, causing all those problems to be neglected whose solution was not adapted to exhibit the omnipotence of the methods which the world owes those immortal minds. So much so that we may say that, excepting Newton's *Philosophiae naturalis principia mathematica* (1686) and some hints of Leibniz[6] of a "*Characteristica geometrica*," a few pages of Huygens (1629–1695)[7] and of Maclaurin (1698–1746)[8] as also, finally, some memoirs by Stewart (1717–1785)[9] and

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[1] See Zeuthen's interesting note "Sur les quadratures avant le calcul intégral et en particulier sur celles de Fermat" (*Bulletin de l'Acad. danoise des Sciences*, 1895).

[2] *Mem. de l'Acad. des Sciences*, 6, Paris, 1630.

It is important to bear in mind that some inaccuracies in the *Observations sur la composition des mouvements, et sur les moyens de trouver les touchantes des lignes courbes* by Roberval were rectified by Duhamel (1797–1872) in the "Note sur la méthode des tangentes de Roberval" (*Mem. des Sav. Étr.*, 5, Paris, 1838).

[3] See also: G. Loria, "Evangelista Torricelli e la prima rettificazione di una curva" (*Lincei Rend.*, V., 6, 1897, ii.), and "Le ricerche inedite di Evangelista Torricelli sopra la curva logaritmica" (*Bibliotheca mathematica*, III., 1, 1900).

[4] See Fontenelle, *Éloges des académiciens* (La Haye, 1740), 1; Harnack, *Leibniz' Bedeutung in der Mathematik* (Dresden, 1887).

[5] See Fontenelle, *op. cit.*, 2; Arago, *Œuvres complètes*, 3 (Paris, 1855); Brewster, *The Life of Sir I. Newton* (London, 1831), and *Memoirs of the Life, Writings and Discoveries of Sir I. Newton* (Edinburgh, 1855).

[6] *Mathematische Schriften* (ed. Gerhardt), 5, pp. 141–171.

[7] See in particular *Horologium oscillatorium* (Paris, 1673), and *Traité de la lumière* (Leyden, 1691); moreover his scientific correspondence published in *Œuvres complètes de Chr. Huygens* (La Haye, 1888 and follow.).

[8] *A Complete System of Fluxions* (Edinburgh, 1742).

[9] *General Theorems of Considerable Use in the Higher Parts of Mathematics* (Edinburgh, 1746); see its analysis by Breton (de Champ) in the *Journal de*

by de la Hire (1640–1718)[1] and a few efforts to revive the ancient geometry,—efforts to which we shall immediately devote a few lines,—no eminent mathematical production of the epoch of which we speak belongs to pure synthetic geometry.

The attempts to which we have just now alluded are found, we may say, in every century, beginning from the Renaissance, and appear either in the form of editions of the ancient geometers and commentaries upon them, or in that of restorations of works which were not saved from the ravages of time. It is not here in place to speak of the editions and commentaries, but we must devote some lines[2] to the reconstructions, in the first place because their significance is indisputable when they bear the names of Maurolycus (1494–1575), Vieta, Fermat, Schooten, Viviani (1622–1703), Halley (1656–1742), Simson (1687–1768),[3] Horsely (1733–1807), and in the second place because their appearance is the first indication of an awakening of the spirit of geometrical research. And in truth this is a phenomenon which seems to us worthy of the most serious consideration that in such a state of somnolence as preceded the awakening, scientists did not succeed in resisting the fascination exercised by the most ancient investigators, and, in consequence, attempted to tread in their foot-steps and even to imitate their movements and their gestures. We should therefore be led to conjecture

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Math., 13, 1848, as well as a valuable article on the latter by T. S. Davies, in the *Trans. of Edinburgh*, 15, 1844); *Propositiones geometricae more veterum demonstratae* (Edinburgh, 1763).

[1] See—besides Fontenelle, *op. cit.*, 2—E. Lehmann, *De la Hire und seine sectiones conicae*, I. Th., Leipzig, 1888; II. Th., Leipzig, 1890. Of De la Hire we mention here the following writings: *Sectiones conicae in novem libros distributae*, 1685; *Mémoirs sur les épicycloïdes*, in *Anc. Mém. de Paris*, 9; "Traité des roulettes" in *Nouv. Mémoirs de Paris*, 1706; *Des conchoïdes générales*, Id., 1709.

[2] More particulars will be found in the appendices to the first two books of my work, cited above, on *Le scienze esatte nell' antica Grecia.*

[3] Concerning the efforts made by Simson and Stewart to give new life to ancient geometry, see Buckle's remarks in *History of Civilisation in England*, 4. Let us add that the fight in England between analysts and synthetists prolonged itself even into our century; this is proved by the two rival works: *Geometrical Analysis and Geometry of Curve Lines*, by J. Leslie (Edinburgh, 1821), and *A Treatise on Algebraic Geometry*, by D. Lardner (London, 1831).

that in the intellectual life of nations there happens something analogous to what embryology shows to take place in the physical life of every living being; in the same way that every organised being, before acquiring an autonomous and independent life, passes through all the phases of development that the species to which it belongs traversed before reaching the physical state of the generation to which it shall belong, so it would appear that every people before acquiring the capacity of increasing our knowledge concerning the phenomena which are presented by figured extention, must for some time assume the appearance and the ways of acting of those who before them went over the same road. This law of development being accepted as true, we avoid including among the rubbish that which instead is a germ, and we can render an account of certain facts which otherwise would be considered surprising anachronisms. And among these none seems more worthy of mention than that presented by the "Neapolitan School" so much extolled by Chasles,[1] which had as supreme leader Nicola Fergola (1753–1822) and as secondary heads or privates Annibale Giordano (1771 *circa* 1835), Vincenzo Flauti (1782–1863), Felice Giannattasio (1759–1849), Guiseppe Scorza (1781–1843), and others whose names are omitted for brevity;[2] a school which would be placed among those which had very little influence on geometry if it should not instead, according to our view, be retained to represent a stage which the mathematics of the noon-tide of Italy had necessarily to go through before being ready to combat for the conquest of new truths.

11. But it is necessary that we turn back to determine what may have been the influence on the development of geometry of the fundamental concept of infinitesimal analysis, which is considered by a great philosopher and mathematician as the most sublime thought to which the human mind has attained up to the present time.[3] We cannot deny that its appearance had drawn away the

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[1] *Aperçu historique*, 2nd ed. (Paris, 1875), p. 46

[2] For further notice refer to my work entitled *Nicola Fergola e la scuola dei matematici che lo ebbe a duce* (Genoa, 1892).

[3] Comte, *Cours de philosophie positive*, 1 (Paris, 1864), p. 175.

majority of mathematicians from pure geometry;[1] nevertheless the period which comes after this must without hesitation be counted among the happiest for geometry, since the greater part of the problems proposed or solved by Newton and Leibniz and by their immediate disciples must be placed among the most important embraced by geometry, relating to the most recondite and interesting geometrical or mechanical properties of curves and surfaces. As a consequence we see extraordinarily augmented not only the number of curves made the objects of study,[2] but (what is more important) we see introduced the consideration of the singularities of a curve and of new elements connected with this, and we see revealed in consequence fields of research of which no one before had imagined the existence.

The facilities afforded by the Cartesian method for investigations concerning the geometry of the plane, which were at their height when the infinitesimal method came into the possession of the public, naturally compelled scientists to seek an analogue to it for the study of tortuous curves and of curved surfaces. Hence

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[1] This brings a new confirmation of the remark of Condorcet which we referred to in the note at the conclusion of the preceding paragraph.

[2] The lines which the Greeks knew were—omitting the straight and the circle—the three conic sections, the spiral of Archimedes and the analogous spherical curve, the conchoid, the cissoid, and a quadratrix, besides a tortuous curve of Archytas, the hippopede of Eudoxus, and the cylindric helix; to which others may be added when certain historical questions still pending have been solved in a sense favorable to the ancients. To these lines the moderns have added various species of hyperbolas, of parabolas, of spirals (for instance the logarithmic) and of quadratrices (among which is conspicuous that of Tschirnhausen), then the folium and the ovals of Descartes, the cycloid, (see Günther in *Bibl. math.*, 1887), the loxodrome, the elastic curve, the catenary, the cardioid, the epicycloid and hypocycloid, the ovals of Cassini (in particular the lemniscata), the sinusoid, the logarithmic curve, the *versiera* of Maria Gaetana Agnesi (1718–1799) (*Intituzione analitiche*, Milano, 1748, 1, p. 380), certain plane and spherical curves at which Guido Grandi (1671–1742) arrived while trying to solve the famous Florentine enigma (see the work: *Flores, geometrici*, etc., Florence, 1728), then others which Vincenzo Viviani and a friend of his proposed as auxiliary in the solution of the problem of Delos (see *Quinto libro di Euclide, ovvero scienza universale delle proporzioni spiegata colla dottrina del Galileo da V. V.*, Florence, 1647), the parabolic spiral, (see Weyer, *Ueber die parabolische Spirale*, Kiel und Leipzig, 1894), etc., etc. For greater details see Brocard, *Notes de bibliographie des courbes geometriques* (Bar-le-Duc, 1897 and 1899).

the stimulus to the generalisation for space of the method of co-ordinates which, as we said, did not escape Descartes, and which Schooten noted explicitly in the last book of his celebrated *Exercitationum mathematicarum* (1657); hence the origin of the idea of Parent (1666–1716)[1] to represent any surface by means of an equation between the three co-ordinates to any of its points.[2]

This period of preparation of analytical geometry of space is followed by the first period of development, in which figured as leaders Clairaut (1715–1765) and Euler (1707–1783).[3] Clairaut in 1731, when only sixteen years old, published a *Traité des courbes à double courbure*, that was considered worthy of being admired as a marvel of imagination and of ability, in which are solved with rare elegance many of those problems relative to the curves of double curvature which have their analogues in the plane, and others then entirely new. Euler supplied an *Appendix de superficiebus* to the second volume of his celebrated *Introductio in analysin infinitorum* (Lausannae, 1748), in which appendix he not only gave some general propositions concerning the analytical treatment of the theory of surfaces, but made an important application of it to the study and classification of the quadrics. This same famous scientist by the memorable "Recherches sur la courbure des surfaces" (inserted in the *Mémoires de l'Académie des Sciences de Berlin*, 16, 1760) laid the foundations for the study of the curvature of a surface in one of its points, giving his own name to a relation which, by the continual use made of it, is very familiar to all those who are even slightly occupied with mathematics.

To the second half of the eighteenth century belongs also in a large measure the gigantic scientific work of Monge (1746–1818),[4] who, after having given to the analytical geometry of the plane the

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[1] Fontenelle, *op. cit.*, 1.

[2] *Essais et recherches de mathématique et physique*, 2 (Paris, 1713).

[3] N. Fuss., *Éloge de M. Euler* (St. Petersburg, 1783).

[4] I cite here the works inserted in the *Mém. des Sav. étrangers*, 7, 1776 and 9, 1780, and in the *Mém. de Paris*, 1784, and also those which are found in the *Miscellanea Taurinensia*, 5, and in *Mém. de l'Acad. de Turin*, 1. Of the *opus magnum* summarising and completing such works, we shall not speak here.

aspect which it retains in great measure to-day, using systematically the equation of the straight line, introduces the idea so important of *family of surfaces*, and, studying some special families ("Surfaces moulures," ruled, developable, tubular, etc.), disclosed to view a connection intimate and unexpected, because remote, between the theory of surfaces and the integration of partial differential equations, which, illumining both doctrines, revealed to geometers new refulgent horizons.

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(to be continued.)

THE COSMOLOGY OF THE SUMERIANS.[1]

ACCORDING to the Sumerian conception the earth as a WORLD-EDIFICE consisted of THREE PARTS:

(1) The heavenly ocean or AN.

(2) The terrestrial ocean or KI.

(3) The רקיע *raqî'a*[2] or LIL, which stands between the AN and KI.

These three parts were assigned to *the first triad or raḥ* of the Sumerian pantheon, i. e., to Anu, Ea, Bel. To these as such belongs the *world-edifice.*

As there existed a heavenly and a terrestrial ocean, so the LIL or רקיע was considered also under a double aspect:

(*a*) As a heavenly רקיע or AN = shamû, שמים (*shamaim*) or "heaven."

(*b*) As a terrestrial רקיע or KI = irtsitu, ארץ (*arets*) or "earth."

The former keeps back the heavenly and the latter the terrestrial ocean.

This latter consideration gives us the so-called TWOFOLD division of the earth as WORLD-EDIFICE. According to this it consisted:

(1) Of the *upper* world, which is AN-ta = elish, i. e., above: *the heavenly world;*

(2) Of the *lower* world, which is KI-ta = shaplish, i.e., below: *the terrestrial world.*[3]

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[1] The present article consists of the additions to the article of Dr. Radau promised in the last *Monist* (p. 625).

[2] Translated in the authorised version "firmament."

[3] This twofold division is mentioned by Diodorus II. 30, translated in Winckler,

The heavenly firmament or רקיע appears in and is of the form of a "half-circle" or better "plate"—and as the heavenly is only the reflex of the terrestrial, this latter was considered to be the other half of the circle as a whole, i. e., of the firmament רקיע as such. And if the firmament רקיע be round then the heavenly and terrestrial ocean must have the same shape.

The world-edifice is inhabited. The inhabitants which dwell either *in* or *within* the רקיע are ZU, UD, Innanna, Nin-Girsu. Thus they had to become necessarily his, i. e., LIL's children. LIL thus becomes not only the LUGAL or "king," but also the AB-BA or "father" of the gods. ZU, UD, Innanna are the moon, sun, morning or evening-star. Thus we find that even according to Gen. i. 14 the stars are put ברקיע השמים, i. e., in the firmament of the heavens. Each one of these stars has his abode and special sphere not only in the terrestrial[1] but also in the heavenly רקיע. When they are in the latter they are visible, but when in the former they become invisible. The *road* they had to travel when in the heavenly רקיע was marked out for them by the so-called zodiac, which was called in later times *shupuk shamê*,[2] i. e., "the dam of heaven."

The functions of the stars, especially those of the two great luminaries are according to Gen. i. 14, 15 threefold:

(1) להאיר על־הארץ[3]
(2) להבדיל בין היום ובין הלילה[4]
(3) והיו לאתת[5] ולמועדים ולימים ושנים[6]

"Himmels- und Weltenbild der Babylonier" (*Der alte Orient*, III.), p. 62, with these words: "Von diesen beobachten die Hälfte (sc. of the 36 gods) die *überirdischen*, die andere Hälfte die *unterirdischen Stätten*, indem sie über das bei den *Menschen* und den *Göttern* geschehende gleichzeitig wachten."

[1] The abode of UD, e. g., is Ud-unug-^{ki}, i. e., "Shamash-abode" or Larsa; that of ZU or Uru: Uru-unug-^{ki}-ma, i. e., Nannar (or Sin)-abode = Ur; that of Innanna: Innanna-ab-^{ki} (or also to be read: Innanna-unug-^{ki}) etc., etc.

[2] See Winckler, *l. c.*, p. 62 ff.

[3] To give light upon the earth. Gen. i. 15.

[4] To divide between the day and between the night. Gen. 1. 14.

[5] To be for signs. This expresses the *astrologic* signification of the stars.

[6] And for seasons and for days and years. On the course of the stars, especially on that of the sun and moon the *calendar* is based.

No. 2, i. e., "the dividing between the day and the night" is done by the *sun*. He divides what we call "day" into *two equal halves*—but this he does only on *two days* during the whole year, i. e., at the vernal and the autumnal *equinox*. Where the sun rises on these two days is the *East* and where he sets is the *West*. On these two days it takes therefore just as many hours for the sun to travel over the heavenly as over the earthly רקיע, or in other words: the sun is just as many hours visible as he is invisible. East and West becomes thus the two points in the רקיע as a whole where the earthly and the heavenly *touch*, i. e., East and West divide the רקיע and thus also the whole world-edifice into *two equal halves:* into the upper or heavenly and into the lower or terrestrial world. The East of the terrestrial world is however at the same time the West of the heavenly and *vice versa*, for when the sun rises for the "earth" he sets for the "heaven."

The "*nether world*" or *Hades* was considered to lie in the South, i. e., under that point of the "earth" or terrestrial רקיע where the sun stands at noon during the equinox. Also the upper world has a Hades which likewise was considered to be in the South, i. e., under the same point of the "*heaven*" or heavenly רקיע indicated by the sun at noon during the equinox. We would get thus in the world-edifice as a whole two points for East, West, and South! The opposite of the South is the *North*. If we would prolong the two points indicating the South towards the North they would (1) meet in *one and the same* point of the line which connects the East and the West or which divides the world-edifice into the upper and lower world, (2) divide the lower as well as the upper world again into two equal halves. *The point* where they meet is the *North*. The North becomes thus not only the centre of the רקיע, which, as we saw, was considered to be a circle, but also that of the whole world-edifice. Here in this North, in this centre "*dwelt the gods*," there also the "*mountain of the gods*," "*der Götterberg*" was situated.

Now we understand the *name* for the *North*. In Assyrian it is called ishtânu or iltânu, i. e., "*the only one*"—thus called in contradistinction to all the other points, of each of which we have *two*.

There is only *one North* in the world-edifice, this North is the same for the heavenly as for the terrestrial world. In Sumerian the North has the name IM-SI-DI, which Delitzsch[1] translates by "*gerade Richtung*," i. e., all the radii of the great periphery of "heaven and earth" are directed towards it as the centre.[2]

If sun, moon, and the stars are *in* the רקיע, to what god has to be assigned the region around the centre of the world-edifice, i. e., the space between "heaven and earth"?

Speaking from our present standpoint the space between "heaven and earth" is filled out by the air—hence we might be inclined to assign that region to the "god of the air" to the "*Herrn der Luft.*" But there does not seem to exist—either in Hebrew, or in Assyrian, or in Sumerian—a word for "air," at least no such word is known to me. The Hebrew רוח does not mean "air," but "wind, spirit, breath." The Sumerian LIL is = the Assyrian zaqîqu, i. e., "wind, storm," and IM is = shâru, which again means "wind." This latter word gives us the right solution. So far we were able to assign all gods to a special sphere or function in the world edifice. One god, however, remained to whom no such sphere has been assigned as yet, and this is Nin-Gir-su or Rammân. He is, as we have seen above, not a star, but the "god of storm, rain, thunder, lightning, and clouds," and must therefore necessarily belong to the region between the heavenly and the terrestrial רקיע! With this, of course, agrees also Gudea's description of Nin-Gir-su = Rammân, who is said as regards his RI-BA to be like *heaven* and *earth*! Rammân, the thunderer, fills all the space between heaven and earth and thus reaches from the lower to the upper "firmament." To this space must, of course, also be assigned the seven sons of Nin-Gir-su. They too have as the "seven winds" their abode between heaven and earth.

We are thus able to draw the subjoined picture[3] of the Sumer-

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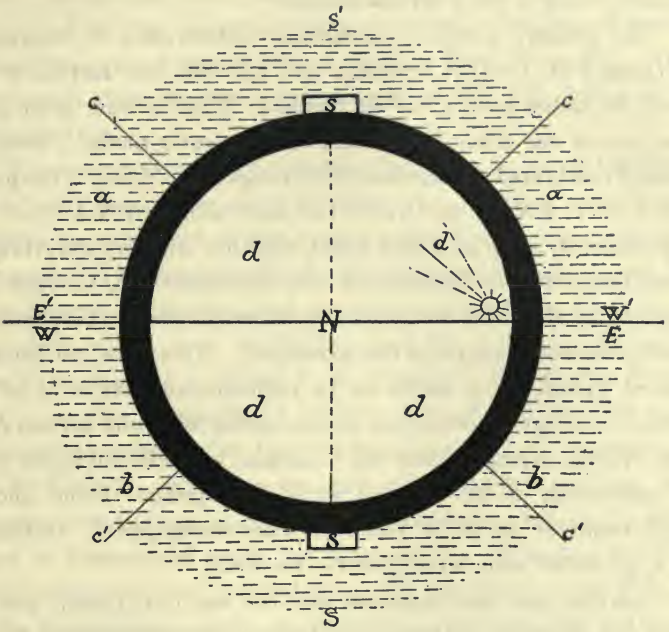
[1] H. W. B. p. 152.

[2] See also the E-pa e-ub-7-na! Ub = kibratu, "*Weltgegend, -richtung*," i. e., "the temple of the seven regions." Gudea, Statue D, ii, 11. (K. B., iii[1], p. 50.)

[3] For another picture see Jensen, *Kosmologie der Babylonier*, Anhang, Tafel III.

ian world-edifice. (See the explanations given underneath). This picture explains also the following points:



(*a*) Heavenly ocean: AN, Anu; (*b*) Terrestrial ocean: KI, Ea; (*c*) Heavenly רקיע: an = שמים, shamû or heaven; (*c'*) Terrestrial רקיע: ki = ארץ, irtsitu or earth; (*c* + *c'*) The domain of LIL or Bel. On this רקיע is to be found the shupuk shamê, i. e., the road which the sun, the moon, etc., had to travel; (*d*) the domain of Nin-Gir-su = Rammân; (*E'*, *W'*, *S'*) the heavenly world; (*E*, *W*, *S*) the terrestrial world; (*E*) East of the earth = (*W'*) West of the heaven; (*E*, *W*) divide the world edifice into two equal halves, and signify the East and West where the sun rises and sets at the equinox; (*N*) North, the centre of the world edifice; (*S*, *S'*) the terrestrial and the heavenly Hades.

1. God EN-LIL or Bel is called very often the "*lugal-kur-kur.*" Kur may mean either "the mountain" (shadû) or "the land" (mâtu). Lugal-kur-kur might thus be translated either by "*king of the mountains*" or "*king of the lands.*" Both translations are possible. If the former translation be accepted, "the mountains" would be the *two halves* of the רקיע. The upper רקיע or "*heaven*" as well as the lower רקיע or "*earth*" appear as a mountain

when looked upon from the *North* or *center* of the whole world edifice! Lugal-kur-kur, when taken in this sense, would mean literally "*king of the TWO mountains.*"

The priestly tradition, commonly abbreviated *P*, informs us (in Genesis xi. 31) that Abraham and his wife and Lot came with Terah his father from *Ur of the Chaldees.* This Ur was, as we know now, one of the chief Babylonian cities in early times, it being especially celebrated on account of its temple dedicated to the moon-god, i. e., to EN-ZU or Uru-ki, the first-born of EN-LIL or Bel. It is generally supposed that Terah together with his son Abraham worshipped or were followers of this very moon-god, because they stopped on their way to Canaan in *Harran*, where there was another celebrated temple of the moon-god. This view, no doubt, is true of Terah, for it ought to be remembered that *he* it is who leaves Ur and goes to Harran, simply taking with him his son Abraham. Terah, therefore, and not Abraham, puts himself again under the protection of his old god while in Harran! From another place, however, we know whom *Abraham* worshipped. In Exodus vi. 2, 3—which also belongs to P—we read:

"And God spake unto Moses, and said unto him, I am Jahveh: and I appeared unto *Abraham*, unto Isaac, and unto Jacob as El Shaddai, but by my name Jahveh I was not known to them."

From this passage we learn that the *same* god appeared unto Abraham as well as unto Moses, but unto the latter under a different *name.* The name had been changed, it is true, at the time of Moses, but the *essence* of that god was and remained the same! Who, then, was this אֵל שַׁדַּי, El Shaddai?

The common translation "lord or god almighty" is simply based upon the LXX. παντοκράτωρ and the Vulg. "omnipotens," and is as such merely a guess. Two explanations seem possible.

1. Shaddai is derived either from the root shadad (שׁדד), "to be dense, to be or to make tight," or

2. It comes from shadah (שׁדה), "to be high," from which we have the Assyrian shadû, "mountain."

If No. 1 be accepted, shadad would be a synonym of raqa' (רקע) from which we get the raqî'a, i. e., something which is or is made

dense, tight,—hence our word firmament! The *ai* at the end represents the old dual ending indicating that there are two firmaments. El shaddai would mean according to this explanation: the god (el) of the two (ai) firmaments or raqî'as. The god of the two firmaments, i. e., of heaven and of earth, is EN-LIL or Bel. Abraham would thus become a worshipper of Bel, the father of the moon-god Sin.

The second etymology, however, seems to be much better and has already been given by Delitzsch[1] who, however, translates El shaddai on the basis of the Assyrian ilu shadû'a by "god is my mountain." This translation I do not think can be maintained. The *ai* at the end of Shaddai must be taken again for the old dual ending, which occurs, e. g., in Shalmaneser II.: "the camels sha *shu-na-ai* tsi-ri-shi-na, i. e., whose back is *double.*" The double *d* stands for *dj*, i. e., the *j* assimilated itself to the *d*.[2] El Shaddai would thus become "the god of the two mountains," i. e., the lugal-kur-kur or EN-LIL, who was the god of the upper and the lower mountain or heaven and earth. El Shaddai accordingly means "god of heaven and earth," or lugal-an-ki. Thus even according to this etymology the El Shaddai of the patriarchs is the EN-LIL of the Sumerians. Above we have seen that even יהוה was = EN-LIL, because both when they appear are accompanied by a prime-minister or angel—יהוה by his מלאך and EN-LIL by his ur-sag ligga ^{dingir} Nin-Gir-su,—i. e., they appear always under thunder and lightning and surrounded by clouds. The statement of P, therefore, that יהוה appeared unto the patriarchs only under *another* NAME,[3] viz., El Shaddai, remaining however the same god as

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[1] *The Hebrew Language*, p. 48.

[2] For such a *retrogressive* assimilation of the *j* comp. among others bunju = bunnu = bûnu: zimju = zimmu = zîmu. Such a word as shaddû, given by Del. H. W. B. p. 642 does not exist. The writing SHAD-di-e, etc., ought to be transcribed by shadê $^{di-e}$, i. e., shadû *plus two* phonetic complements.

[3] Whether יהוה was a name taken from the Kenites or not, would not affect our argument. I myself would see in יהוה simply another name for "*rock*," i. e., יהוה = "he who is, was, and will be," the "rock" that will not pass away nor change. Comp. here the proper name צוּרִישַׁדַּי "my rock is Shaddai," the KUR-

before, is thus shown to be fully justified. El Shaddai is thus proved to be an Assyrian name which translates simply the Sumerian "lugal-kur-kur" or "lugal-an-ki"! Abraham coming from Ur where the Sumerian pantheon was fully developed and known becomes thus a worshipper of Bel or EN-LIL the lugal-kur-kur!

The title lugal-kur-kur however is translated in the later Semitic Babylonian inscriptions always by *bêl mâtâti*,[1] "lord of the lands." If this transcription and translation be correct, then the idea expressed here would be that Bel as the *firmament* embraces all the "lands" on the terrestrial as well as on the heavenly רקיע—for the "lands" are situated IN the רקיע.

2. The dominion of Bel is sometimes spoken of as a *char-sag kalam-ma* or *shad mâtâti* as "the mountain of the lands," and Bel himself is called KUR-GAL[2] or shadû rabû, i. e., "the great mountain." Bel is the god of the רקיע, which רקיע is, as we saw, a *circle* or a *mountain*. In this mountain or circle as a whole the "lands of heaven and earth" are situated. Bel becomes thus not only "the great mountain" or "circle," the רקיע, but also the "mountain of the lands."

3. Later inscriptions speak of a so-called "mountain of the rise of the sun" and of a "mountain of the setting of the sun," which mountains lie in the East and West respectively. The earth being considered as the *lower* half of the great circle called רקיע is, of course, at its extremities, i. e., in the East and West *higher* than on any other part. The earth seems to be always *higher* at the horizon than where we stand.

4. The earth as world-edifice in the form of a circle or better globe[3] explains the whole system of the Sumerian reckoning, according to which the circle was divided into 360 degrees, the year into 360 days, etc., etc.

GAL (the great rock) and the char sag kalam-ma (the mountain of the lands) of the Sumerians, and see below.

[1] See e. g. Shalmaneser II. Obelisk, l. 3: ^{ilu}bêl KUR-KUR. Or should we transcribe here also "shadai"?

[2] See Jensen, K. B. III^{1}. p. 16, note 3, and E. B. H. p. 65, note 1.

[3] Consisting of two halves or plates—the upper being put or resting upon the lower.

5. It removes all the difficulties which Winckler still finds in his conception of the Babylonian cosmology.[1]

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A few minor points may be added by way of a postscript:[2]

A strange difference is to be found between the Biblical account of the creation and the Sumerian theogony. According to the latter Sin or EN-ZU, the moon-god, is the *firstborn* of EN-LIL, and hence *precedes* Shamash or UD the sun-god. In Gen. 1. 16 on the other hand Shamash is called "the *greater* light,"[3] while Sin is named "the lesser light,"[4] thus the former apparently precedes the latter.

What is the reason for this?

Winckler[5] confesses: "Das babylonische Pantheon stellt nicht den Sonnengott, sondern den Mondgott an die Spitze—*warum, ist noch unklar.*" The reason is this: As the chaos preceded the cosmos, as the darkness the light, thus the *night* preceded the day, and Sin[6] being "he who governs the night," must necessarily

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[1] See Winckler, "Himmels- und Weltenbild der Babylonier," *Der alte Orient*, III. (1901) pp. 59–65.

[2] See editorial note in last *Monist*, p. 625.

[3] המאור הגדול. [4] המאור הקטן.

[5] "Himmels- und Weltenbild," etc., p. 65.

[6] Sin precedes Shamash also in the old Arabian pantheon. Our investigation enables us to identify that pantheon with the second triad or raḥṭ of the Sumerians. Wadd, Sîn, 'Amm, Haubas—all names for the Sumerian EN-ZU or Uru-ki, the moon-god, have been correctly identified. The same is true of Athtar and Shams—the former is the dingir Innanna, the morning or evening-star, the latter dingir UD, the sun—with the difference, however, that Athtar has become a masculine and Shams a feminine. Even in later Semitic *Babylonian* inscription Ishtar as "the morning-star" was, as was pointed out above, p. 39, considered to be a masculine deity. If the old Arabian pantheon represents the gods of the second triad or raḥṭ of the Sumerians, then an-Karich, Chaul, Anbâj, and Almâqu-hû must be Nin-Gir-su or Rammân. Hommel, *Die südarabischen Altertümer des Wiener Hofmuseums*, p. 28 ff., identified them either with *Nebo*, because (1) "Anbâj" is a broken plural of Nabiju, which stands for the older Nabi'u; (2) Chaul = חול "Phœnix" ("der ja vom Weihrauchlande, Hadhramôt, her nach Aegypten fliegt, also ein richtiger מלאך oder Götterbote ist"), or with the "Sternenheer" = Almâqu-hû. With regard to an-Karich he is in doubt, thinks however, that this god is "wohl auch" = Nebo.

Above we have seen that Nin-Gir-su is the ur-sag of EN-LIL,—hence a מלאך or *minister*, just as Chaul = חול is. Chaul is here the *minister* of Sin, because Sin is the chief-god, who was even in Assyrian times identified with Bêl (see above p. 50) hence might also have an ur-sag! But it is not necessary at all to identify Chaul with the bird Phœnix (see Job xxix. 18 and Herodotus ii. 73); the signification which the root חול gives on hand, is a much better one. חול or also חיל is used in Jerem. xxiii. 19; xxx. 23 of the *storm* and has the signification: *wirbelnd losbrechen hernieder auf etwas* (c. על). See Gesenius-Buhl *sub voce*. Even in Assyrian we have a root חיל with the signification "*beben, erbeben*," and a chîlu

precede Shamash, who governs the day. This is also the reason why in early times the "day" consisted of "*night* and day"—accepted even by P: "there was evening and there was morning, the . . . day." This latter, no doubt, is a relic of the Sumerian conception of the day—for among the Sumerians Sin was the *father of Shamash*. The precedence of Shamash represents thus a later stage: it shows P lived at a time when Shamash had been put before Sin. But if the day began with the evening or night, then the *year* must have begun with the *winter*, and the *beginning* of the year could not have been the 21st of March (the 1st Nisan) but must have been the 21st of September (the 1st Tishri). This month Tishri, which signifies "beginning," corresponds, as was shown in E. B. H. p. 295, to the month Ezen ^{dingir}Ba-u, which was still at the time of Gudea (about 3300 B. C.) the *first month of the year*.[1] According to another nomenclature Tishri corre-

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or *Hochflut*, see Del. H. W. B. pp. 274, 275. The god Chaul would become thus the "god of the *stormflood!*" and might be read Châwil.

Almâqu-hû—thus read by Hommel—is derived from the root למק "to destroy," "to beat." Rammân as the god of *lightning* destroys the wicked. I would like to see in this word a surname of Rammân and read "*almaqu-hû*," i. e., "his (sc. Sin's) chief destroyer or warrier = ur-sag lig-ga. To this explanation fits also an-Karich from the root כרה, Del. H. W. B. p. 352, b: "in Not bringen."

Anbâj too is not a broken plural of Nabiju = Nabi'u—why should there be a *plural* for the name of a god, seeing that this god is only a shajûm?—but also an *elative form* (like almaqu-hû!) from the root נבה and has to be read = *anbaju*. נבה I would like to take in the sense of נבא, Del. H. W. B. p. 442, b. "*hervorsprudeln, hervorquellen*," from which we get the namba'u, "*Quell, Wasserquell*," and the imbû'u, "vegetation," and especially nib'u "*Spross, Fruchtertrag u. dergl.*" Rammân would thus become as the "god of rain" he who PRODUCES *vegetation*—hence he is called by Shalmanesser II., Obelisk, l. 7: [^{ilu}Ramm]ân gish-ru shú-tn-ru bêl che-gal-li, i. e., the strong one, the powerful, the lord of the *abundance* or *riches* (sc. of the fields). With this agrees quite wonderfully also the name *ur-^{dingir}Nin-Gir-su*, which name is not only that of an early Babylonian *patesi* (see E. B. H. p. 441 for references), but which also is translated in the bilingual texts by *ikkaru* or *farmer, husbandman, Landmann, Ackerbauer, Landwirt*, see Del. H. W. B. p. 58 *sub voce*. *Ur-^{dingir}Nin-Gir-su* literally translated would mean the "dog or servant of Nin-Gir-su." But Nin-Gir-su is = Rammân who as the god of rain is also the god of *fertility!* And what is more natural than than that the farmer should be called "the servant or dog of the god of fertility"? This latter name not only proves that our identification of Nin-Gir-su = Rammân is correct, but also that anbaju may—nay, must,—have this signification here.

With this then is proven the *Babylonian* origin of the old Arabic pantheon, which was accepted at a time when Sin had become identified with Bel (above p. 50). That the Babylonians indeed influenced the ancient Arabians is proved by the fact that even Semitic Babylonian *words* are found in old Arabic inscription, as e. g. לבת = libittu, לבן = labânu (this latter is found in one of the oldest hadhramotic inscriptions from Obne), משחכן = mushkênu, צנק = sunqu, see Winckler, M. V. A. G., 1901, 4, p. 70.

[1] Gudea, Statue E. V. 1, 2; G. III. 5, 6: ud zag-mu ezen ^{dingir}Ba-u "on the New Year's day, the festival of Ba-u."

sponds to the month A-ki-it, which means "New-Year's festival." Tishri is also = the Canaanitish אתנים which again was the first month,[1] and Tishri is still the New-Year's month of the Jews of to-day. The present Jewish New-Year's month thus goes back to the most ancient times: to the time of the Sumerians.

The creation of Nin-Gir-su = Rammân, the god of thunder, lightnings, rain, storm, and clouds has been omitted by P! The reason is apparent. He did not fit into P's formula. It was impossible to say: And Elohim said: "Let there be thunderings, lightnings, storms, etc. . . . and there were. And Elohim saw that *they were good!*" "*Good*" lightnings, storms, etc. cause quite a "good" deal of havoc. Thus not wishing to imply that the Creator might have destroyed something of what he created—P left out the creation of the storm and lightning altogether.

H. Radau.

Waterloo, Ill.

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[1] 1 Kings viii. 2. E. B. H. p. 298.

LITERARY CORRESPONDENCE.

FRANCE.

SO extensive is the new work of M. G. TARDE, *Psychologie économique*, that I cannot think of giving a complete analysis of it within the limits of a correspondence. Neither is it incumbent upon me to expound the details of M. Tarde's system, which I have already brought to the notice of the readers of *The Monist*, and which in the present case we see applied to political economy. It is scarcely necessary to say that these two volumes, which constitute a course of lectures delivered in the Collège de France, are replete with attractive *aperçus*, and will be read with lively interest.

For the traditional division of political economy into *production*, *circulation*, *distribution*, and *consumption*, M. Tarde substitutes the following: *repetition*, *opposition*, *adaptation*,—finding, thus, in the phenomena connected with human wealth also, the three aspects which he has made it his aim to consider in all his investigations. These aspects, in the social *milieu*, appear to him as the immediate expression of human passions, beliefs, and desires in their contact or conflict, at least in so far as conflict is by its results concerned with the life of societies.

The ambition of M. Tarde is always to discover, therefore, behind social, economic, or other phenomena, the individual situations, or rather the intermental action of individuals, or what might be called their psychological mutuality. It would be, thus, the object of "interpsychology" to ascertain the effects resulting from the abstract laws of general psychology, in all the phases of the intercourse of individuals with one another.

So far so good. But the difficulty begins when this method sets up the pretension of constituting all of sociology. For sociology cannot exist unless it have a subject-matter, an object of investigation of its own. Now, the effects which spring from psychological mutuality are new products, original products. If it be true, for example, that the assignment of a piece of land to some one owner, or its division among several, stands for the resultant act of some conflict of desires and passions, it is none the less true that the fact or manner of obtaining possession of the land is an actualised fact, an objective, concrete fact, a solidified fact as it were. And then again, the actualisation of this fact does not depend entirely upon the degree of force or shrewdness displayed by the competitors; it also depends on circumstances of a different nature, on opinions, institutions, populations, etc.,—in fine, on a pre-existent social state. And consequently the entire subject-matter that is genuinely sociological is in danger of escaping altogether the grasp of psychology, or for that matter even of inter-psychology.

It does not follow from what has just been said that I endorse unqualifiedly the common procedure of the orthodox economists; they are unable, despite their aspirations, to rise above a simple description of economical events, and M. Tarde possesses over them the advantage of exhibiting the intimate relations connecting the psychological factor with its measurable products. Will he be successful in tiding over, more fully than they ever have, the descriptive period? This is another matter, and if I am not mistaken, this is the principal matter. As I have repeatedly declared, I can conceive sociology under no other aspect than that of a comparative study of social facts objectively considered,—conducted with a view to discovering how these facts vary as functions of one another, and to define if possible the laws of their simultaneous and successive variations.

By what, let us ask, are the facts to be selected? This is a difficult question, and one that appears to me to offer the true ground of discussion. In any event, we cannot accept as social facts the entities of the economist,—value, labor, wages, etc.,—

abstract expressions under which the actual facts are decomposed rather than classified. But it does not appear that we should be under any consequent obligation, on this head at least, to accept simple psychological states. The very laws of imitation which have been so skilfully utilised by M. Tarde are never more than the means or direct instrument of the individual facts, and it is the resultant of these facts which is alone of interest to sociology. Now, since this resultant, viz., the social expression of psychological phenomena, assumes a thousand forms, the first problem of sociology would consist, I say again, in noting the essential forms in the guise of which other forms are recapitulated, the right being reserved to open special chapters under general titles.

From this point of view, the researches of the older economists cease to constitute an independent science; they are subsumed necessarily under the general discipline of sociology, where the economical facts find their place, for example, under the category of *production*, where the word *production* (the doctrine of the late lamented Ad. Coste) would apparently designate a group of well-defined facts which find speedy elucidation from their relations with other facts.

Does all this mean,—for I have devoted myself almost entirely to objections,—that the two volumes of M. Tarde are not a distinct contribution to our understanding of economical and social phenomena? Far from it. On the contrary, I find them extremely instructive. The criticism which I have advanced is concerned entirely with the reduction of sociology to the terms of a system of psychology, to a schematic situation, of which the three underlying theories are those mentioned above. I believe it is an indispensable prerequisite to the establishment of the science of social facts to abandon individual psychology, and that these facts cannot be explained directly,—even in the brilliant pages of M. Tarde, for whom I have the liveliest admiration,—by simple states of consciousness of individuals.

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M. Marcel Foucault, in a meritorious and conscientious work, *La Psychophysique*, has not undertaken to expound and criticise all

the researches now comprised under this name. He has adhered to the meaning of the word which Fechner gave, and looks upon psychophysics as a method of measuring mental phenomena by comparing them on the one hand with physiological phenomena and on the other with physical phenomena, or more precisely (since Fechner was forced to stop at this point) as a method of measuring psychological phenomena (or, as he called them, sensations) resulting from the impressions made by the physical world on the sensory organs.

The examination of the works which relate to this subject is extensive; the work of M. Foucault takes up over 500 pages. I shall simply notice conclusions. The law of Weber is the experimental basis of the measurement of sensation, and consequently the basis of psychophysics as conceived by Fechner. Now, what are we to think of this law? M. Foucault on this point concludes that the "empirical" results of the experiments made with a view to controlling it are unfavorable; they prove unmistakably the law of a *maximum of distinctness* in the majority of perceptions. It is not possible in the present state of our knowledge to say with any certainty what the law is according to which we determine durations, the saturation of colors, and the pitch of sounds. There exist accordingly several empirical laws relating to the distinctness of our perceptions, which it is important to determine; special empirical laws, perhaps, for every species of perceptions, as well as for every class of perceiving subjects. The task set, for a science of psychological phenomena, is the reduction of all these particular laws to more general laws.

The law of Weber appears to M. Foucault to be one of these laws; it is not incompatible with those which appear to contradict it; on the contrary, it assists us in comprehending them. It can only be said, and this reservation is indispensable, that the distinctness of the perception is independent of the absolute force of the excitation, other things being equal. The deviations of the laws of Weber are explained by the existence of the multiple conditions of attention, education, fatigue, etc., which we suppose to be equal, but which are not, especially when the excitations are

very feeble or very constant. In short, it is extremely probable that the distinctness of the perceptions remains constant amid all the absolute variations of the excitations, provided the conditions of perception also remain the same. All of which is tantamount to saying that the distinctness does not depend upon the absolute force of the excitations, but on the conditions of the perception,—conditions which psychophysics should now endeavor exactly to define.

As to Fechner's personal achievement, M. Foucault is of the opinion that this illustrious scientist was mistaken with regard to the true scope and import of his labors, but that they have still been far from sterile in their influence. If the hope of obtaining a rigorous measurement of the intensity of sensations was chimerical, the methods of Fechner nevertheless enable us to measure an important characteristic of perceptions. This measure has now finally, thanks to him, its place in psychology.

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Darwin, as we know, connected phenomena of beauty with sexual selection. M. Lucien Bray, in his book *Du beau, Essai sur l'origine et l'évolution du sentiment esthétique*, accepts this thesis; but he is perfectly aware that it is insufficient to explain the evolution of the sentiment and idea of beauty in man, and *a fortiori*, therefore, the development of the arts which express it. For the physiological basis he accordingly substitutes a psychological basis; and he finds this new basis in the theory of emotion, as that is understood by Lange, James, and Ribot,—a theory still much disputed by scholars such as Binet, Dumas, and others, who nevertheless gladly accept its principle.

As for the physiological basis, certain objections or restrictions are possible. Is it absolutely sure, for example, that the indicatory function of colored organs is the only scientific explanation of the beauty of plants? And what inference can we draw from the supposition that their colorings attract the insects which seek their pollen and so facilitate their fertilisation? Does not the diversity of the types of beauty in animals and men rather militate against the theory of selection? Is it not a fact that the sexual needs pri-

marily accommodate themselves to what they find? And when the choice is made, secondarily, of certain characters, does not such a choice, uncertain and disordered as it is, actually imply a search for beauty in the correct and special sense of that word?

However that may be, we shall have to seek farther and uncover other sources to explain the voluntary beauty created by human art. We may indeed say that whatever there is of life is ultimately reducible to the two acts of *nourishment* and *reproduction*; but it by no means follows that the sentiment and the idea of beauty have been adequately defined by connecting them with either the one or the other of these fundamental tendencies. This is why M. Bray seeks to establish his researches on a broader basis. He speaks of a "tendency to mark oneself off in some manner from one's fellows," a tendency implied in sexual selection which is objectively realised by manifestations of different sorts,—as movements, cries, songs, colorings, and so forth,—and which, when translated into consciousness and attaining a suitable development, is subjectively revealed by that peculiar emotion which is called the æsthetic.

So far so good. But is this tendency, of which the emotion of the beautiful is the psychological equivalent, primitive or derived? M. Bray thinks it is difficult to decide this question. He is not averse to seeing here a combination of the reproductive instinct, either with the tendency to get rid of the surplus of organic reserve which leads to love and to games, or with the instinct of domination, of superiority, or even with both conjointly. And this complex tendency is not equivalent to the sexual instinct pure and simple which we are constrained to transcend.

Once these premises have been accepted, all æsthetics remains to be constructed. M. Bray here feels very distinctly that to explain artistic vocations, to explain art and its evolution, it is necessary to appeal to other factors, and at first to sensorial factors. It is unquestionably interesting to investigate how the sexual instinct permeates our entire psychological life. But so many facts interpose themselves between this instinct and the higher sentiment of beauty that the primitive soil disappears beneath the new ground

upon which myriads of blossoms unfold their petals, the solid rock vanishes beneath the made soil that covers it.

With these remarks upon the main thesis of M. Bray, it remains for me to commend his erudition and the wealth of details which his work contains. I consider it a performance of merit.

* * *

M. Dr. G. Grasset offers us in *Les limites de la biologie* a work laden with quotations and criticisms, from which we can draw much that is of value. What he seeks to demonstrate is that biology is not the sole and exclusive science, which embraces all the others, and, also, that there is no single and exclusive law embracing all other laws. The scope of these two declarations is not exactly identical; there is no doubt but biology does not embrace morals, æsthetics, sociology, etc.; yet we should not forget that man, before becoming a moral person, an artist, or a metaphysician, is an animal which it behooves us to know, and that he not only brings to society his intellect and his soul, but also his body. Again, in so far as it affects the rôle of an explanatory science, biology has done no more than replace physics and chemistry, which sciences had themselves replaced geometry. Every science has fulfilled in its turn the rôle of universal explanation, and the nobility of its effort, however futile we may esteem the result, remains nevertheless its justification before the court of history. But the declaration of M. Grasset involves additionally the condemnation of this explanatory office, of which it would utterly deprive biology. And thereby hangs indeed a tale. I should beg him to consider on this point that monism is primarily justified as a "point of view" merely, and that there exists metaphysical monisms and idealistic monisms as well as material and vitalistic monisms. It is difficult to escape some one or another of these forms of thought, when we endeavor to separate the sciences of the mind from the sciences of matter, and one is soon driven into their fold when one attempts to reach any general conception of the universe.

I specially recommend the last chapter of M. Grasset's little book, which treats of theology and religion. It is the performance of a man of worth and deserves our attention.

M. L. DUGAS, in his *Psychologie du rire*, examines and also rejects all the theories which have been offered for bringing laughter under some single and intelligible point of view; in other words, for making it a true object of science. Laughter, he correctly remarks, is a peculiar phenomenon which is met with in opposing and contrary states; it is an accident and nothing more, and is in itself neither good nor bad. From the moral or æsthetic point of view, the value of laughter consists solely in the mental state of the person laughing, a state which is relative and variable; and in addition, it cannot be evoked by an act of volition: laughter is the instinctive expression of the individuality of each single one of us. It can never be an *end* for us, it is essentially an end of nature; it is the mask concealing a physiological *trigger*.

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From M. FRÉDERIC QUEYRAT we have an excellent study, *La logique chez l'enfant et sa culture*, which completes the series of this author's monographs devoted to intellectual education. M. R. P. JULES PACHEU gives us an *Introduction à la psychologie des mystiques*, a subject to which M. GODFERNAUX has just published an admirable study in the February number of the *Revue Philosophique*, to which I refer the reader. M. ALBERT BAZAILLAS gives us *La crise de la croyance*,[1] a work treating of three thinkers: Ollé-Laprune, Balfour, and Newmann. In the latter, who is the most interesting of the three, M. Bazaillas explains and describes the struggle of temperament against the spirit of doubt, and of faith nourished by imagination and sentiment against skepticism based on reason. From M. OSSIP-LOURIÉ, also, we have a work entitled *La philosophie russe contemporaine*, an interesting commentary upon the little known subject of the evolution of philosophical thought in Russia, which has grown predominantly in the three directions of general philosophy, psychology, and sociology. In this latter field will be found the names which are most familiar to us, viz., Karéiev, Lavrov, Krapotkin, Herzen, Bakounine, Kovalewsky, De Roberty, Novi-

[1] Paris, Perrin publisher. The other works mentioned are published by F. Alcan.

cow, Tchitscherin, and Pobedonotzeff. It is not for me to discuss the general spirit which animates the work of Ossip-Lourié; his readers will have to discover that for themselves, and this labor is perhaps the one that will most interest them. The intellectual characteristics of the Russian philosophers are exhibited in his criticisms as clearly as in the works which he criticises; but one would have to know Russia more thoroughly and at first hand to do full justice to M. Ossip-Lourié's work.

M. F. Picavet, one of our most noted historians of philosophy, has given us a new French translation of Kant's *Critique of the Practical Reason*, with an introduction on the philosophy of Kant in France from 1773 to 1814, and valuable philological and philosophical notes. This translation will undoubtedly be of great service to English readers also, for every translation of the work of Kant requires in certain passages nothing short of an interpretation of the original text. I may add that this second edition is augmented with an *Introduction to the Study of Kant's Ethics*.

From M. Le Comte Domet De Vorges, we have a book on St. Anselm which constitutes a new and remarkable addition to the *Collection of Great Philosophers*. Besides the interest which attaches to the philosophical doctrines of St. Anselm, the history of his life and of his time has many attractive features to recommend it to our attention.

* * *

Just as I was concluding this Correspondence, I received a copy of *Les caractères* by M. Fr. Paulhan. This second edition of this excellent work, of which I have already spoken, contains a new and important preface. M. Paulhan replies in this preface to the objections which were advanced against his thesis, and thus finds occasion for explaining more amply than before the ideas upon which he has based his investigations and the plan which he has followed in his classifications. Classification is not exactly the proper word. M. Paulhan does not classify individuals; he classifies rather traits of character which he then arranges in partial systems; and it is these systems to which he refers by fragments his real individuals, so as to lose nothing of their personality. The

correlation of traits of character being, according to him, an entirely individual affair, he does not attempt to give the "impossible" classification of an individual in a single group, but he aims to classify the system of traits which constitute the individual's personality and which he connects with "systematic series," with a view of "comprehending their scope and value."

Undoubtedly M. Paulhan admirably justifies his analytical method, or method of dissecting the individual; he also well shows the defects which inhere in the synthetic process of classification. He endeavors in the first place to furnish more complete descriptions and better portraits, and only secondarily seeks for the points of contact existing between individuals thus sketched in detail. Yet may not many persons be characterised with some exactitude by one of these partial systematisations—realised in individuals chosen as types, by reference to which the author establishes his abstract groups? Will not the most careful comparison of individuals always tend towards a classification of some simplicity, and must we renounce absolutely all attempts at synthetic classification? This is an open question. Whatever may be the result, this work is upon the whole the best and the most thoroughly worked out of any that we possess in this department of psychology.

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A posthumous work of M. DURAND (DE GROS), *Questions de philosophie morale et sociale*, is given us with an introduction written by M. D. Parodi. I cannot recommend too highly the perusal of this work, which is the last that the really superior mind of Durand (de Gros) has bequeathed to us. M. Parodi expounds with lucidity the thought of the savant and philosopher, and speaks of the man in lofty and sympathetic terms, for which all who learned to appreciate and love M. Durand (de Gros) will join me in gratitude.

Last autumn, another man of great ability was taken from us, ADOLPHE COSTE, in whom I personally lost a dear and excellent friend and the French school of sociology one of its cleverest and most lucid writers. Not long after, in February, occurred the death of MME. CLÉMENCE ROYER, one of the most eminent women that the nineteenth century has produced, and whose conversation, lively and interesting despite the infirmities of age, I always appreciated, even when I did not share its sentiments. To these three noble departed souls, whom to-day I join in single thought, I tender the heartfelt homage of a friendship which cannot forget.

PARIS, March, 1902. LUCIEN ARRÉAT.

CRITICISMS AND DISCUSSIONS.

NOTES ON CONSCIOUSNESS.

In the following "Notes," whenever I use the word *matter* I use it not as denoting abstract existence or any special mode of concrete existence, but as denoting that objective reality of which we are conscious in experiencing resistance. Let me explain. This reality is not necessarily simple matter. It is energy, whereof the factors, physicists tell us, are matter and motion. Matter may be distinguished from motion as the thing that moves. Motion, on the other hand, may be distinguished from matter as the generic and genesial change that matter undergoes—a change that may be conceived as originating in the immediate contact of the ultimate particles of matter (giving rise to interaction) in the plenum of the universe. If not thus conceived—if motion is assumed to be an intrinsic property of matter—energy and matter, we must admit, are the same thing. In the view here suggested, motion is a material change arising from the law of stress, operating in the universal plenum. Be this as it may, the product of matter into motion, or of matter into itself through motion (the involution of matter), I hold, name it power, force, energy, momentum, what you will, is the fundamental fact of human knowledge, everything else that exists for man being derived from it, and resolvable into it.

I.

When one billiard ball meets another, the balls are, in a sense, conscious of the impact; that is, both undergo changes responsive to it—the only sense, as I conceive, in which consciousness of any degree is intelligible. These simple changes present consciousness in its lower forms; from which it ranges, through interactions of increasing complexity and integration, till it culminates, so far as our narrow ken may reach, in the consciousness of man. Perhaps the most pregnant feature of these changes, as of the changes of consciousness in every other degree, is that they exist exclusively for the subject of them. The changes in neither ball exist for the other ball, or for any other thing (be it particle or organism) in the universe. It is commonly assumed that this exclusiveness is peculiar to psychical phenomena as they appear in man. It belongs in fact not only to recognised psy-

chical phenomena as they appear in man, but to all phenomena without exception —to all action. Strictly, the universe is one expanse of consciousness, continuous as the sea, though discrete like the waves. The pressure received by the table on which my arm is resting exists for the table alone, as truly as the answering resistance exists for me alone. The molecular transformations which the pressure sets up in the table, and which constitute in philosophical exactness a direct knowledge of the pressure, are for the table, and not for me, or anybody else, or anything else; precisely as the molecular transformations which the resistance sets up in my brain, and which constitute a direct knowledge of the resistance, are for me, and not for the table, or anything else, or anybody else. I cannot occupy the table's center of stress, any more than the table can occupy my nerve-center. The principle of identity forbids this: a thing cannot be itself and at the same time something else. Consciousness, throughout its range (from the infinitesimal to the infinite), may be defined as the change which a unit of any order undergoes, to the exclusion of all other units of every order. This definition, if I mistake not, includes the three traits at once essential and peculiar to consciousness: immediacy, subjectivity or interiority, finality—the first expressly, the other two as corollaries from the principle of exclusiveness. It shuts out self-consciousness, as incompatible with all.

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Consciousness, as we know it in ourselves, seems the orderly yet consolidated revival in organic structure of past affections or impressions, by present ones in unison with them; the revived impressions representing the impressions which through eons have wrought the structure, and reacting on the impressions that revive them. In other words, consciousness of this degree is the state wherein the organism, as a whole, becomes responsive to the behavior of its parts, as parts—wherein the structural register of what is common to all the affections of the organism, yielding the concept of self, interacts with the inferior structures yielding concepts of things, percepts, and sense-impressions—wherein awareness (interaction in its simpler forms) is carried up into personality, through an organic unity higher than that of life—wherein the automatism of life rises, through evolution, into the seeming spontaneity of mind.

* * *

All knowledge is immediate knowledge, or reducible to immediate knowledge. Whatever we know immediately we know as existing, seeing that in immediate cognition the action of the object is unaffected, except by the equal reaction of the subject; and we can no more doubt such action—can doubt it even less—than we can doubt our own existence, for the knowledge of our own existence is derived from it. *Nosco ergo sum.* "I know" implies my existence, to be sure, but not my immediate knowledge of it. The knowledge of my existence presupposes the conception of self, which is formed, like every other conception, by the mediate process of abstraction and generalisation: the knowledge is derivative, not intui-

tive. The foundations of knowledge are thus laid as deep and sure as existence itself.

* * *

What other theory of knowledge offers so high a warrant of certainty as the theory that one thing knows another thing by the direct action of that thing upon it, with its own reaction upon that action? To me this exchange of equivalent activities is the principle of knowing, and at the same time of doing—of transformation, development, evolution. Consciousness in one of its aspects is simple actuality, and belongs to everything that exists, in the exact character and measure of the existence. Change, interaction, actuality, consciousness are but different aspects of the same thing. The interaction of things is the intuition of being, and, hence, philosophically, is knowledge, whether involved in elemental obscurity, or expressed directly in terms of developed mind. Consciousness, indeed, is so completely identified with existence, that a distinctive name for it seems hardly necessary or proper, and, in my opinion, has proved actually misleading. A distinctive name for a universal property could scarcely have proved less than misleading, since it implies that what in reality belongs to everything belongs only to things in a special order of combinations. It is said the Greeks had no term for consciousness until the decline of philosophy, and it is perhaps a fit subject of regret that they ever got one, for it is difficult to see what end it has served, except to handicap philosophy, while making its course darker and more slippery than it might otherwise have been. In the morning freshness and sanity of the Greek mind, the relation between the organism and external nature was felt in its simplicity. The refinements and sophistications that have since obscured the relation are the morbid effects of thinking of it above that which is written. Unfortunately, what deities and demons once were to poetry, hypostatised abstractions still are to philosophy. The machinery of the poets has vanished, that of the philosophers lingers, bright with use, if not unimpaired in strength. Is poetry, then, more congenial to truth than philosophy? Or are the illusions of philosophy more subtle and more deeply lodged? However this may be, it behooves us to bear in mind that what we name consciousness is abstracted from existence. Let us take heed how we assign individual substance to this abstraction, pregnant with significance though the concrete is.

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Two things may be equivalent without being the same, except in kind; and such is the relation of consciousness to the components whereof it is the resultant. The equal reaction with which one atom or one infinitesimal answers the action of another appears to me the seminal principle of consciousness, as of all other forms of existence. Out of it grows the phenomenal universe, comprehending mind in its whole line and scope.

II.

Self-consciousness, as described by the psychologists, is a self-contradiction. For what is it that is conscious? Self, say they. And of what is it that self is conscious? Self, again. Self is thus at the same time both subject and object—an absurdity. Self, they explain, is conscious of its own states; that does not mend the matter. A thing not only is indistinguishable from its attributes but consists of them; subtract the sum of its attributes, and nothing remains. Besides, these states, as manifestations of a conscious self by hypothesis, exist only as the constant sequents of that self; whereby, self becomes its own cause, as well as its own object—the absurdity doubled.

* * *

That which happens to people, when they fancy they are self-conscious in the primary sense of the term, is the focusing of consciousness on the organism, as distinguished from the environment, abstracting the subject from the object, and concentrating attention on the former, the concentration being determined, like concentration in other parts of the field of consciousness, by interest, pleasure, excitement, shock, or whatever else, directly or indirectly, may send a wave of stimulation to one ganglionic center rather than to another. It is to be remembered in this relation, furthermore, that consciousness may embrace without confusion a number of objects at once—as many as six or seven, in the opinion of the elder psychologists—probably several more actually, with its potentiality in this respect yet unexhausted. Obviously, this fact affords within the horizon of consciousness a considerable scope for the play of attention—that is, for the concentration of a single consciousness on various points in various degrees. As respects the possible objects of simultaneous attention, consciousness may be focused on one, or extended with different degrees of concentration to several, or distributed faintly among all. This field of consciousness attention, tethered between subject and object though it is, can be made to traverse from one limit to the other, backward or forward (as attention vibrates between the terms of a relation), without justly exposing consciousness at any point to the charge of transcending itself in self-consciousness.

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A subjective fact and an objective fact are not different facts, but the same fact in different points of view,—the same fact withdrawn by abstraction from the subject and the object alternatively; that is to say, every fact of consciousness is a subjective fact or an objective fact, according as consciousness is concentrated on the subject or the object,—as one or the other of these terms in the relation of knowledge dominates the psychic field. As respects self-consciousness, the distinction between this concentration of consciousness on subject or object, and the concentration of consciousness on consciousness is very broad. In the former, consciousness is concentrated by external agency (external to the individual movement

of consciousness) in a particular part of its field; whereas, in the latter, consciousness is assumed to concentrate itself on itself. The one operation involves only a simple distribution of attention, under the law of causation; the other would violate both the law of causation and the law of identity. One is the sea raised into ground-swells by storm or earthquake; the other, the sea without wind or shock raising itself into ground-swells, and precipitating itself upon itself.

* * *

As for self-consciousness, the difficulty is not that consciousness is an ultimate fact (were it so in the fullest sense it would not on that account elude the supercognition implied in the assumption of self-consciousness), but that it is a fact at all; since no fact can be other than itself, as consciousness would have to be did it react on its own action, thereby becoming self-conscious. The truth is, the difficulty consists in the absence of difficulty. Sheer change, viewed with the existing prepossessions of philosophy, appears naturally an inadequate account or no account of consciousness. Its very simplicity, combined with its immediacy, perplexes observation under such conditions, baffling attention by standing within its guard, so to speak. Yet consciousness, if we consider it well, can have no higher credential to offer; for, though it confronts everything else in its field, it is like the eye powerless to confront itself.

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Self-consciousness and the immateriality of mind are pseudo-conceptions born at the same birth. It is perhaps not easy to say which of these twin illusions first saw the light, but I am disposed to recognise the priority of self-consciousness; which, having as a contradiction no place in reason, must needs be placed in a realm beyond reason, where contradiction is the touchstone of truth rather than of error, and whereof one may say, as Tertullian said of a cherished dogma, "It is certain because it is impossible." Before the date of self-consciousness as a philosophical tenet, the exigencies of philosophy, though giving rise to countless absurdities, had not called for the immateriality of mind, so far as I am aware; but thereat this absurdity became an instant necessity.

* * *

What is called the reflective or philosophical consciousness, and is supposed to be self-consciousness, is a greater complexity, speciality, and range of responsive energy, including a more or less complete independence of the immediate environment, due to the evolution of the species, united with the training of the individual, who by means of it, however, is no more enabled to bring about a consciousness of consciousness, though the psychologists (verbally at least) suppose that he is, than a gymnast, by means of athletic training, is enabled to lift himself by his boot-straps, or step clear of his shadow.

* * *

It is this actual, face-to-face experience that constitutes immediate knowledge (consciousness), whether in a particle, in man, or in whatever beings superior to

man the cosmos may hold. The universe is a unit, governed by unitary laws, and the highest being in it is as incapable of self-consciousness as the smallest particle. In this world of unknown possibilities, but of known law, a contradiction is the one thing that we are warranted in pronouncing impossible, unconditionally and forever.

* * *

The view of self as anything else than the psychological self, developed from the unity inherent in the nature of an organism, seems on the point of being abandoned by psychologists themselves. So stanch an idealist as the author of the article on Psychology in the ninth edition of the *Encyclopædia Britannica*, having admitted that "voluntary and non-voluntary attention are fundamentally the same," expressly leaves to the self "only the one power of variously distributing that attention upon which the intensity of the presentation in part depends." This admission appears significant; for, if "voluntary and non-voluntary attention are fundamentally the same," the former is resolvable into the latter, and explained by it, rendering unnecessary, and hence unphilosophical, the assumption of a special entity to explain it. The hypothesis of the self as a conscious subject, distinct from the phenomena of which it forms the center, is thus logically surrendered. It was logically vanquished long ago.

III.

Consider the act of thinking. What is it? The cat lying on the manuscript before me, for example, excites in my brain the common trace left there, and in the ancestral brain, by all the received impressions of cats. This is a perception of the cat: it is a thought,—the realisation of the concept or idea of a class in an individual object of the class. If now the perception of the cat for any reason excite in my brain the common trace of all impressions, of whatever objects, received by me, and by my ancestors to the remotest ancestral form, I realise through an individual of the most general class the concept of self, as the symbol of the common property of that class; which is the perception of the cat rounded out on a higher plane. In the first instance, the thought consists in the idea of a cat, as excited by the individual cat, and is called objective, attention being focused (consciousness concentrated) on the individual cat or object; in the second instance, the thought consists in the concept of self, as excited by the idea of a cat, excited in turn by the individual cat, and is called subjective, attention being focused on the self or subject. An organism receives certain associated impressions (percept); which excite in it the common trace of like impressions received by the individual and its ancestors (concept of the object); which, again, excites the common trace of all impressions, like and unlike, received in like manner (concept of the subject). Here, as I conceive, is the outline of mind,—perception, generalisation, personality; and no immateriality,—no self-consciousness: nothing but consciousness, in terms of interaction, comprehended in the organism that interaction has generated.

The concept or idea, in the view I take, is the symbol of the general trait of a class of objects, revived by the action of one or more individuals of the class on the general trace registered by the whole; and which itself revives the symbol of the most general trait of all objects whatever, by acting on the most general trace which they have registered,—that is, the trace of their common relation to the organism. These symbols are not psychical, in the sense of being hyperphysical. The nervous trace or register of psychical states has no psychical counterpart in that sense, but of itself, when excited, revives the more recent or intense of the psychical states that have wrought it, and which themselves, like all other states designated psychical, are in reality special modes of material nature,—physiological states, integrated and transformed in the highest co-ordinating center of the organism. In consciousness the object has no counterpart, except the subject, whose interaction with the object it is that constitutes consciousness,—distinguished conveniently as psychical, but which, as the product of physical factors, is itself physical, distinguishable from its factors in form only.

IV.

Relations in the environment set up in an organism (arising itself from secular interactions) corresponding relations, either term of any one of which, according to physical laws, revives the relation, and with it, more or less vividly, the group of relations to which it belongs, and which it thus symbolises or represents, exhibiting therein the first lines of the division of general awareness that we distinguish as mind. In short, the fact of purely physical association is the immediate source of symbolism in its whole import; which import is less intelligible in man than in the amœba, the orchid, or the crystal, only because it is more extensive, more various, more complex, more independent of direct impressions, more remote in general from the elementary state, but which in all is at bottom qualitatively the same.

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The progressive integration of molecules with like molecules to the exclusion of unlike ones, in a solution of several salts, has the same kind of meaning,—is in all essential respects the same operation,—as the progressive integration of impressions with like impressions, to the exclusion of unlike ones, in the nervous masses: crystallisation and generalisation are but different exemplifications of the same process. In crystallisation, unlike generalisation, it may be said, there is no recognition of the likeness of the integrating units. How is that? Under a physical law, the necessary condition of admission into the forming crystal is likeness. The integration of the units, therefore, is itself a recognition of the likeness. Integration and recognition are two aspects of one act. Actions speak not only louder than words, but before words exist.

* * *

The paper-weight that I hold in my hand I am compelled to think as one with my consciousness of it, in the ultimate analysis of both. I am conscious, it will be

admitted, that the energy which I exert in lifting the paper-weight, and the resistance of the paper-weight, are equal; but the relation of equality presupposes the relation of likeness in kind. Hence, I cannot be conscious that two things are equal without being under the necessity of granting that they are connatural,—not necessarily the same in form or mode, observe, but the same in nature. Nor does this necessity, if accepted, lead to inadmissible consequences, as Mr. Herbert Spencer thinks. Mr. Spencer herein appears to overlook the true meaning of form as distinguished from matter. A paper-weight and my consciousness of it are immensely different in form, yet I am bound by an absolute necessity to believe that they are the same in matter. If, indeed, a simple proposition which I am compelled to accept is not true, what is true? Not certainly my own nature which in this case would compel me to accept a lie.

* * *

The state of consciousness is simply a transformation of the resistance of the paper-weight, differing from it, relatively, in the same manner that one allotrope of an element differs from another, or one isomer differs from another. As terpene, for instance, is the common substance of the essential oil of lemon and the essential oil of orange, or as carbon is the common element of charcoal and the diamond, so is mechanical force, in a sense more recondite (revealed by a deeper analysis), the common substance or the common element of the paperweight and the state of consciousness. The two forms of the force are different, the force itself, and the quality of the force, are the same in each; and we are disabled from thinking of the force as subjectively and objectively different, it seems to me, not in the first instance, as Mr. Spencer assumes, because the conception of mechanical force is the most general of our conceptions,—for, manifestly, if it were not real, the mere generality of it would offer no barrier to thought—but first of all because our cognition of mechanical force is not a conception, but an intuition—an immediate cognition—a simple consciousness—which necessitates the identity of the object in consciousness and the object in existence; for the activity of the object and the counter-activity of the subject, wherein the cognition consists, are axiomatically equal. Besides, were the object in consciousness and the outer object not the same, the cognition, in lieu of immediate, would be mediate, inasmuch as the former object, not being the object of consciousness (that which by interacting with the subject makes consciousness), would have to be the subject interacting with itself, or, what is equally inadmissible, a representative of the object without the credentials of interaction, and the possibility of immediate cognition would disappear: the condition supposed would subvert consciousness.

* * *

The disability [to think of mechanical force as subjectively and objectively different] which Mr. Spencer undertakes to explain away is coeval with thought. It is not secondary, but primary—not a product of experience in the ordinary sense of the expression, but the subjective obverse or reverse of an objective impossibil-

ity. It has been generated in us by the absolute uniformity of our experience, superadded to that of the experiences of ancestral forms running back to the simplest of these, being the register of a uniformity in external nature, uniformly repeated by millions of generations. The limitation is organic, existing in the first cognition of the developed organism, in as full vigor as in the millionth or decillionth. That a thing is itself and not anything else is a truth which, once distinctly cognised, can receive no confirmation from repetition, though the repetition were infinite. We realise our inability to conceive the negation of it, not after scaling a towering hierarchy of abstractions, but with our first step on *terra firma*.

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The human mind is organised and evolved responsiveness—a comprehensive reflex of the outer forces and relations that have moulded it. Fundamentally, all psychic action is reflex action, no matter how multiplied or how complicated—Shakespeare's intellection no less than a rhizopod's feeding; and reflex action is mechanical action. The impression of a rose, received by the senses, modified and transmitted by the nervous centers, and discharged in plucking the rose, undergoes the same general change as the impulse of a breeze, received by the vanes of a windmill, modified and transmitted by the axes, wheels, and other gearing, and discharged in lifting a bucket of water; or as the pressure of the mainspring of a watch, received by the barrel, modified and transmitted by the wheelwork, escapement, and balance, and discharged in pointing out the time of day. The mechanism, whereby the force is transformed and carried from the point of application to the working point, is relatively simple in the last two cases, and surpassingly complex in the first case, but in all the cases equally the operation is mechanical—the enormous difference in degree may obscure but cannot alter the identity in kind.

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The intelligence of man, the selection of plants, the motion of inanimate things (so-called), are all to my view fundamentally the same: the first may be resolved into the last, the last (granting suitable conditions) involved to the first. An apple on the tree, pulled by gravity, held by cohesion, and falling or sticking as one form of energy or the other prove the stronger, is (not in the eye of fancy but in philosophical soberness) a type of human conduct in its utmost reach and diversity—exhibits in a rudimentary form what in man is called perception, reason, will. With respect to the quality known as psychical, the sole difference between Newton, and the apple that he watched in the garden at Woolsthorpe, is a difference of degree. At no point in the vast scale can one say, "Here the physical falls short, and the hyperphysical completes the evolution." Philosophically, the entire system of things is for man, I doubt not, a question of physics. As the profoundest demonstration in mathematics may be resolved into steps so short and easy that a child can take any of them, so those steps, I am convinced, may be resolved into reflex actions, which in turn may be resolved themselves into simple reaction.

Although the development of mind from what we distinguish as matter is hard to realise in the existing stage of human experience, the thing we call matter is a fact, and a fact, moreover, to whose capabilities no limit is assignable; whereas, the immaterial entity or nonentity, invoked to supplement the alleged incapacities of matter, is not only not a fact, but infinitely the reverse, admitting of neither comprehension, nor apprehension; it is a mere creature of ontology,—of metaphysics twice removed beyond the bounds of sense. The choice, then, lies between a fact of illimitable capabilities, and a figment incapable of representation in thought.

* * *

Mechanical force, or the reality which we know under that inadequate and deceptive name, is something; that which is not mechanical force, or cannot be reduced to some sensible form of it, actually or ideally, is nothing. Mechanical force, as I here said, is not simple matter. Nor is it simple motion. It is matter in motion—energy—the only state in which either matter or motion can be directly cognised by man. Matter is the body of energy, motion the soul. Energy is existence.

* * *

No effort of consciousness enables us to assimilate consciousness and motion, it is said. True; for to assimilate consciousness, and motion in some other form, would be to make consciousness conscious of itself, as well as of the antecedent motion, since the consciousness of a relation implies a consciousness of both terms of the relation. When one thinks he is representing in consciousness a unit of consciousness, side by side with a unit of motion or anything else, he deludes himself. He is conscious of only one term of the fancied comparison; to be conscious of the other term—a unit of consciousness—he would need the standing-place that Archimedes postulated as the condition of prizing the earth from its orbit.

v.

If we would avoid the radical contradiction of psychology, modern and ancient, I can see no stopping-place short of the conclusion that the processes of the brain which we call mental, save consciousness only, are strictly not mental at all. On the contrary, they seem to stand outside of the central consciousness, albeit structurally correlated with it, and ready functionally to enter it under the requisite stimulus. They might be called sub-conscious, as belonging to the separate consciousness of sub-centers of the brain, but not as belonging to the distinctive consciousness of man, except when they actually enter into its sphere from without, like other external objects. Sub-consciousness, in any other sense, has to me no meaning. If the word is to be used without impropriety, it can mean only unconsciousness. Provided an object is out of consciousness at all, it matters not, so far as outness is concerned, whether it is under or above consciousness—whether it is stationed at the door, or stands so remote that it may never reach the threshold.

The human organism, like every other organism, below or above it in the scale of being, may be regarded as consisting of interdependent organisms or systems of organisms, each with its own center of consciousness, subservient to that of the organism or system of organisms next above it, with which as subject it interacts as object, but of which it is not otherwise a subconsciousness. When we speak of being subconscious of this thing or that, we in fact are conscious of it vaguely or dimly, not unconscious of it. To say that we are conscious in any manner or measure of what is below the threshold of consciousness is an arrant contradiction. Feeling, for instance, to return, is one of the great parts in the trichotomy of mind to which Kant set the seal of authority, and some psychologists maintain that the other forms of consciousness, in that famous division, are developed from feeling. Psychologists agree, however, that there can be no feeling without consciousness, and also that what some of them call the correlative of feeling is physiological. What is this but saying that feeling is the consciousness of this physiological correlative? Every psychical state has a physical factor or so-called object. If, as all admit, a feeling is a state of consciousness, what is the object or objective element of the consciousness? A pleasure or pain is undeniably a psychical state. What is its physical factor or object? Not the feeling itself, for that is psychical, to say nothing of the impossibility of being its own object. What then? What but that which psycho-physiologists call the physiological correlative of feeling? In my judgment, we are bound to identify feeling with cognition, under penalty of contradiction. When I smell a rose, the odor stimulates my olfactory center, and the consequent pleasure I experience consists in the consciousness of this stimulation, just as the perception of red consists in the consciousness of the corresponding stimulation of the optic center. Pleasure and pain, with all intermediate feelings, consist as exclusively in the consciousness of their several objects or physiological counterparts as acknowledged cognitions do. A pleasure or pain is the consciousness of its object, be that object localised or unlocalised, as the perception of a tree is the consciousness of its object; and the object of the one consciousness is no more or less subjective than the object of the other. Psychologically, the only difference between the feeling and the perception is the difference between the objects (physiological correlatives) of the two states or acts of consciousness, the object of the feeling being one mode of the nervous system, the object of the perception another mode; the feeling and the perception alike are cognitions. And what in this respect is true of feeling is equally true of conation, which is but a mode of feeling, the will being at most the resultant of a complex of feelings. There remains only cognition; to which, on a just analysis, all the mental phenomena, I am persuaded, will be found reducible. Mind is a special form of energy, and, on the energy of mind passing into another form, the mental form does not pass with it—the energy alone passes; wherefore, in that other form the energy is not mind, any more than heat is light, though it may readily pass back into mind, as the energy of either of these may pass into the other. In fine, mind is the functioning of

the organism as an organism. When the organism is not thus functioning, the mind is not actual, but simply possible; it exists not *in actu* but *in posse*. It may revive in greater or less degree the next instant, or it may never revive in any degree; but, which ever occurs, the mind in the interval or the stretch does not actually exist. It exists potentially, if at all.

VI.

The mechanism of intelligence, as might be inferred *a priori*, appears most distinctly in the lower classes of the animal kingdom, whose inner and outer relations are so few and simple as not to obscure the character of their mutual adjustment. A turbellarian worm, for example, is shadowed by an object, which it presently touches, and draws back: a visual impression is followed by a tactual impression, both of which modify the vital processes of the worm, the tactual impression modifying them in such wise that the resulting contraction takes the creature away from the obstacle. The several terms of this series—the visual impression, the tactual impression, the recession—become in the course of vermian experience indissolubly associated with each other (the laws of association confessedly govern all nerve-tissue), so that the third term appears to follow the first without the intervention of the second, motion being transmitted in regular succession instantaneously through the consolidated series, as through a recognised train of mechanism; whereby eventually the turbellarian, on feeling the shadow, recoils at once, without staying for the actual touch to make it recoil, as a man walking a railway, on seeing the coming train, gets off the track, without staying for the train to knock him off. No biologist will deny that this effect, in the case of the worm, is due to changes in processes purely physical, subject to the physical law of association; yet here, rudimentarily, is perception, representativeness, volition—the impression of a shadow; the inseparable association of that impression with the impression of the touch that follows it; the like association between the recession and the impression of the touch that precedes it, the recession, be it noted, following the shadow mediately in reality, immediately in appearance—that is, what in man we would say was the recognition of the shadow as a signal of retreat, and the consequent retreat, which the touch would have enforced if the worm had not prudently anticipated it, all of which is really true of the worm in a rudimentary sense: here in fact, clear of everything immaterial—clear of everything not mechanical—is incipient mind on the highway of evolution, already beyond the first stage, and travelling at speed. The correspondences between the turbellarian and the environment are limited in space and time, few, immediate, simple, unspecialised, co-ordinated in a low degree, loosely integrated—were it otherwise they could not exhibit the fundamental characteristics of intelligence in such clearness and distinctness; yet, develop the correspondences in these several particulars, and you pass from turbellaria to man, in the bewildering complexities of whose intelligence the simple characteristics of it seem lost.

Whatever difficulty one finds in taking the view of mind I have indicated (and to the average person the difficulty at the first blush may seem insuperable), he will do well in his suspense, if conscious of suspense, to anchor his judgment in the broad truth that the phenomena of mind, without exception, are subject to the law of causation, the negation of which is unthinkable; and, here, patiently ride at anchor, till at some new stage of experience, or some new reach of training, the fog shall lift from the sea, and the sun light up the shore. Be the night short or long, the land is there, and the morning will reveal it.

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SPENCER'S DEFINITION OF EVOLUTION.

It is a hazardous venture to call in question so basic a formula elaborated by such a master of the subject as the definition of evolution and dissolution laid down by Herbert Spencer. Yet as philosophy and science acknowledge no pontiff, the privilege of raising a question is at least open, and it may even be that finality is not yet reached.

Spencer's celebrated definition of evolution, although well known, may be repeated here:

"Evolution is an integration of matter and concomitant dissipation of motion; during which the matter passes from an indefinite incoherent homogeneity to a definite coherent heterogeneity; and during which the retained motion undergoes a parallel transformation."

His conception of dissolution is the converse of this,—"the absorption of motion and disintegration of matter."

To establish and illustrate his definition of evolution, Spencer utilises such cases as the evolution of a solar system from a nebula, of a living organism from its ovum, of complex civilisations from crude social states, and numerous others.

In these instances the definition applies perfectly. The evolution of a solar system from a nebula, for instance, is a typical integration of matter, with a passage from an indefinite incoherent homogeneity to a definite coherent heterogeneity. But how about the evolution of the nebula? Can the same formulæ that fit the evolution and dissolution of a solar system apply to a nebula? Apparently not; on the contrary, the two formulæ would appear to be exactly reversed.

No final theory as to the origin of nebulæ has yet been formed; but if the common notion, which too has been countenanced by Spencer, that they arise from the collision of stars approximates the reality, then the evolution of a nebula consists in a dissipation of matter and an absorption of motion,—the reverse of the definition.

On the other hand, the dissolution of a nebula is brought about by the very process by which a solar system is formed from it. The transformation of the

nebula into the solar system constitutes the evolution of the solar system, but it is also the dissolution of the nebula. The process is one and the same; but it has a double aspect. From the standpoint of the nebula it is dissolution, from that of the solar system it is evolution. Here, then, is a clear case in which a process of dissolution, that of a nebula, consists in an integration of matter and a passage to a definite coherent heterogeneity,—precisely the reverse of Spencer's definition.

A single exception to the truth of the definition is sufficient to overthrow its universal validity. Similar considerations when applied to other instances of evolution, will, however, yield results similar to those in the case of the nebula. The evolution of an organism from an egg is one process of dissolution of the egg. The transformation of a series of organic forms from one species to another is the evolution of the subsequent species but the dissolution of the precedent species. In the passage of a people from a simple social state to a complex civilisation, the evolution of the civilisation follows the lines of Spencer's definition; but the same process brings about the dissolution of the simple society. Thus, the transition from feudalism to modern democracy was the evolution of the latter but the dissolution of the former.

In general, evolution and dissolution are the same process, viewed from different sides. The universe is made up of physical and psychic elements undergoing continual change and rearrangement. The transformation of one order or arrangement of things to another order or arrangement is both evolution and dissolution; it is the dissolution of the preceding order, but the evolution of the succeeding order. There is but one process of change from any one order to the next succeeding order of things; sometimes the transition is an integration of matter, sometimes it is a dissipation of matter. Evolution therefore is sometimes an integration, sometimes a dissipation; and dissolution is the reverse aspect of the same process.

As the cases of evolution and dissolution are exactly equal in number, Spencer's formulæ of evolution and dissolution according to this conception would each seem to hold good for just one half of the cases of cosmic transformations. The two definitions are complementary, reversible, and interchangeable, and to complete their applicability they would have to be conjoined.

This analysis would seem to reduce the process of evolution to a simple continuous mechanical flux and rearrangement of the material and psychic elements of the universe that is always and everywhere going on, and to take from the conception of evolution the idea of progression that is generally accepted as being implied in that of evolution. This implication of progress is, however, somewhat illusory. In the first place, there is no absolute or universal standard by which progress or regress can be judged. For purposes of convenience or in our intellectual vanity or shortsightedness we may establish ideals or standards; these standards may be useful for a time, but with changing conditions they become altered or obsolete. Again, the idea of progress is apt to assume a teleological tone, and

thus to become a discordant element in a philosophy and science based on immediate causes alone.

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THE RISEN CHRIST AT DAMASCUS.

In any consideration of Jesus's resurrection appearances, whether to the disciples or to Paul, it is well to make a distinction between the vision hypothesis and the apparition hypothesis advanced in explanation of that remarkable series of events. The term *vision* is commonly used of what is seen in a dream, ecstasy, trance, or the like, and especially of experiences of a purely subjective nature. The term *apparition* is more suitable in those cases which seem to be accompanied by none of the abnormal psychical conditions, and in which the impression of the objective reality of the appearance is more strongly and vividly felt by the percipient.

It is unnecessary to dwell upon the supposition that Jesus's death on the cross was only apparent and that he was afterwards so revived that he was able to appear again among his friends: for although this grotesque hypothesis has been often accepted as explaining the appearances to the disciples, it could certainly not account for the appearance to Paul at Damascus. So also the rationalistic explanations of Renan and others, of a storm on Mt. Lebanon, a flash of lightning, or a sudden attack of ophthalmic fever, need not concern us here. The view that Paul was stricken with sudden blindness in which he recognised the arresting grace of God[1] is ingenious, but is unsatisfactory in important particulars, and also finds little support in the evidence given by Acts, chap. xxvi, the passage containing the earliest account of the event outside of Paul's own writings. And again, Baur's method of proving from the Acts accounts, without regard to Paul's testimony, that the appearance was simply visionary and was later transformed into a myth, is now generally rejected.

The vision hypothesis in varying form has been advocated by such scholars as Holsten, Hausrath, Pfleiderer, Weizsäcker, and Holtzmann. Their conclusions always rest upon a large basis of truth, but are generally to be regarded with suspicion in proportion as they affirm the simply naturalistic character of the event. The hypothesis of Holsten combines the usual features of the vision hypothesis with certain other ingenious elements, and rests upon three fundamental propositions: (1) That Paul made no distinction between vision and supernatural reality; (2) that the later visions of Paul were essentially similar to the appearance at Damascus; (3) that the previous Christophanies to the disciples were visions and regarded as such by them and by Paul. Stated more fully, Holsten's theory affirms

[1] Matheson, *Spiritual Development of St. Paul* (1890).

that visions were currently regarded as the chief means of divine revelation and that their objective reality was never questioned. According to this view, for instance, the distinction made in Acts xii. 9 between a vision and an actuality is not a distinction between bodily and spiritual realities, but merely between realities conceived of as existing in the earthly or heavenly state. In other words, the Jews regarded a vision as an objective heavenly reality and not a mere symbol of something else. Accordingly the Christophanies were believed to be visions having objective reality and giving assurance of Jesus's resurrection and life in the heavenly state. To express this still differently, the disciples believed that Jesus had left his earthly body in the tomb and had after his resurrection been clothed in a heavenly body of light by means of which he was able to appear to men on earth, thus indicating to them his resurrection. And let it be all along remembered that these were really subjective visions (according to Holsten's view), arising in the disciples' minds from a sub-conscious conviction of the truth of Jesus's resurrection, and having all the appearance of objective reality. And, as admitted by Holsten himself, such visions would lead to but one conclusion, namely that Jesus was in the heavenly life with God. That they would indicate Jesus's bodily resurrection is not a part of the hypothesis, which is bound to deny this belief to the apostles and attribute it to later tradition.

The basis of truth underlying the vision hypothesis must not be disregarded. Paul himself was subject to visions, especially in the important crises of his career; and that these visions were apt to be of an ecstatic character is quite evident in 2 Cor. xii. 2–4, where the apostle testifies that on one such occasion he was unconscious of his own bodily presence, and like the East Indian "adepts" entered a state of "illumination" in which he heard words which the world was not ready to receive. But on the occasion of his conversion what a combination of circumstances favorable to an ecstatic experience!—the fatigue of the long journey across the desert beneath the noonday sun; the remembrance of the odious work of persecution which was now to be renewed; the fruitless struggle for righteousness in contrast to the joyous confidence of the Christian martyrs; finally, the lingering recollection of the dying Stephen and his vision of the glorified and ascended Christ. How gladly would Paul be convinced, if he could but surmount the difficulty of the resurrection! (Holsten, Pfleiderer.) Then moreover, "the pure bracing air of the desert produces an extraordinary elation of mind. The very sanest seldom escape without hallucinations."[1] How natural, then, that all these circumstances should unite in raising before Paul's eager imagination a glorious image of light in which he recognised the heavenly Adam, "the man upon the clouds," the Messiah himself risen from the dead!

Now much of this representation must be acknowledged as true; but the bearing of such facts as these must never be lost sight of. In Paul's case the *condi-*

[1] Sprenger, *Mohammed*, I., 216.

tions were exceedingly favorable for witnessing an extraordinary phenomenon, and under other conditions the event might have assumed a very different form. These circumstances, therefore, are to be taken into account in explaining what occurred; they are the natural conditions, and natural conditions are required for every event that ever takes place. But supernatural conditions are also required, for all events have both a natural and supernatural aspect at one and the same time; and any hypothesis which disregards this fundamental principle is to be rejected at the outset.

The arguments ordinarily adduced against the vision hypothesis are to a large extent worthless. Especially is this true of the attempted contrasts between Paul's other visions and his experience at Damascus. Thus we are told that elsewhere Pauls hows the greatest reluctance to speaking of his visions, but that he makes it his loudest boast that he has seen the Lord.[1] Whereas Paul would very naturally give the latter event full publicity, since it was the guarantee of his apostleship and the one circumstance which placed him on equal footing with the Twelve. Again, we are reminded that Paul in his ecstatic trances felt himself snatched up into paradise, but that at Damascus he had no such experience—as if the ecstatic state were bound to result on each occasion in the same or similar sensations without variation in imagery or vividness. Further, Beyschlag argues from Paul's three days' blindness that there must have been an objective reality; although it is now well recognised that hysterical blindness is one of the ordinary symptoms of the ecstatic condition.[2] Beyschlag also cites Paul's vivid recollection of the exact time and place of the Christophany as an evidence that it was not a mere ecstatic vision—as if it were not a usual matter for Paul to remember years afterward the exact circumstances of his visions, whether at Troas or Jerusalem. It is also pointed out that Paul was a man who urged the necessity of testing the spirits of ecstatic revelation,[3] and that accordingly he could have made no mistake in regard to the nature of the appearance at his conversion. As a matter of fact, the dividing line between true perception and illusion or hallucination is often impossible to determine, and the ecstatic trance occurs in every degree of intensity from the slightest aberration to the most profound catalepsy.[4] Indeed, the most cautious observers are often found to be the victims of the most unaccountable delusions. And finally, when it is urged by Beyschlag, Krauss, and others, that a vision could never have led Paul to a belief in Jesus's bodily resurrection, we can only say that it would be difficult for a vision to produce such a belief, but certainly not impossible. As a whole, the refutation of the vision hypothesis has called forth many misdirected efforts which have proved nothing except the superfluous zeal of their authors.

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[1] So Weiss, Paret, Sabatier, Godet.

[2] See James, *Principles of Psychology*, I., 206.

[3] 1 Cor. xiv. 29.

[4] Bernheim, E. Gurney, Baldwin, James, Sidis.

And further, in the case of Holsten's hypothesis, it is useless to argue, as Beyschlag does,[1] that the Acts writer thinks of the appearance as visible to Paul's companions and therefore not a vision; for according to Holsten's theory the Christophany would be regarded as an objectively existent heavenly reality and as such visible to all present. And again, it is quite futile to contend that such appearances, regarded as visions of heavenly reality, would not have led the disciples and Paul to a belief in Jesus's bodily resurrection, for this Holsten himself acknowledges, taking refuge in the assertion that this material conception was the product of later tradition.

The vulnerable point in Holsten's theory is not its psychological impossibility, for psychologically it is not only possible but exceedingly plausible. Its vital defect lies in the fact that it is unhistorical, resting upon a gross misconception of the Biblical theory of visions and upon a false notion of the Jewish and apostolic doctrine of bodily resurrection. In the first place, it is untrue that in those times men made no distinction between vision and supernatural reality,[2] for the essential characteristic of the Biblical vision is its symbolism. But in the second place, as Beyschlag has further pointed out, the hypothesis of Holsten rests upon a Hellenistic doctrine of resurrection found only in Josephus and later writers.[3] It is a mistake to lose sight of this fact and strive to show that "in this attempt to explain the rise of the Christophanies which led to the belief in Jesus's resurrection lies an inner contradiction, namely that the belief itself is always posited as giving rise to the visions" (Weiss). Certainly it is no contradiction to suppose that a sub-conscious belief in Jesus's resurrection, present in the disciples' minds on the basis of the greatness of Jesus's own personality, should come to full certainty in a vision. So when a final appeal is made to the empty tomb to refute the vision hypothesis (Beyschlag, Gebhardt, Güder, Weiss, and others), Holsten simply replies that the apostles thought of the resurrection as the clothing of the released soul with a new body of glory, the fleshly body being left to pulverise in the tomb, or else being mysteriously stolen, the theft being charged upon the disciples. The decisive question to be put to Holsten is simply this: What was actually meant and understood by the "resurrection" of Jesus? What did Paul himself understand by the term? There can be but one answer: he understood the living again of Jesus's entombed body, whether in material or glorified form.[4] The resurrection body,

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[1] *Theologische Studien und Kritiken*, 1864 and 1870.

[2] See Num. xii. 6–8; Gen. xli.: Acts x; xvi. 9; etc.

[3] See also Steude, *Theologische Studien und Kritiken*, 1887.

[4] So 1 Cor. xv. 4, where Paul mentions the tomb as an essential middle term between Jesus's death and resurrection, regarding the latter as a coming forth from the tomb accompanied by a transfiguring change (cf. Matt. xxvii. 53; John v. 28 f.). Even in the case of the decomposed body, Paul posited a connection with the new body; how much more in the case of the dead but not decomposed body of Christ! (Rom. viii. 3.) Of course the new body would not be the same

according to Jewish thought, was not a new and essentially different body from the earthly one; it was a body of flesh transformed into a body of glory. This position is fully supported by the emphasis placed upon Jesus's bodily resurrection by the primitive apostles and by Paul himself.[1] It is evident, therefore, that it is on these grounds that Holsten's whole theory falls to pieces, namely its misconception of Biblical visions and its un-Jewish resurrection doctrine.

We may notice, in passing, the theory of Holtzmann, which embodies the vision hypothesis in its most attractive form.[2] Briefly stated it is as follows: The exalted Christ is a life-giving spirit with a corresponding spiritual body, consisting not of flesh and blood, but having the form of the heavenly man.[3] Paul's idea, therefore, of the Christ who appeared to him is of a fleshless and bloodless light-substance which by its very nature could become visible only to the inner man and which could appear only upon the mirror of his spirit.[4] Holtzmann's conclusion is that the appearance at Damascus consisted simply in an inner vision of the heavenly man of Paul's previous thought, arrayed in a body of glory. This variation of the vision hypothesis depends upon the quite unwarranted assumption that Paul believed the "fleshless and bloodless light-substance to be by its very nature visible only to the inner man." This theory is unjustifiable in its disregard of the express statement of Acts, that the phenomenon was visible both to Paul and to his companions, and also in its perversion of the evident intention of Paul's own declaration that he has "seen the Lord." It is no less than precarious to attribute our modern philosophical conceptions to a Jew of the first century who was a disciple neither of Kant nor of Berkeley nor of Hegel.

It is wholesome to acknowledge, however, that the vision hypothesis as usually understood rests upon a very considerable basis of truth, and that in so far as it does so it must continue to command the attention of thoughtful men. It is no argument against it to say that it does not explain Paul's boast of having seen the Lord, that it does not account for the ethical character of the event, that the occurrence itself does not bear the marks of an ecstatic vision, etc. These and similar assertions are futile. If the desert journey, the midday heat, "the vast silence of nature," Paul's fatigue, his hitherto unrewarded search after a higher righteous-

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in organism,—but the same as being the organ of the soul (Beyschlag; cf. 1 Cor, vi. 13 f.). To Paul our modern ideas of a purely immaterial existence deprived of all space relationships would have been inconceivable. (See also Weber, *System der altsynagogalen palästinischen Theologie, etc.;* Schultz, *Alttestamentliche Theologie.*)

[1] Acts i. 3, 22; ii. 31–36; iii. 15, 21; iv. 2, 33; v. 31; x. 40, 41; xvii. 31; Rom. i. 4; iv. 25; v. 10; viii. 10 f., 34; x. 9; 1 Cor. xv. 4; 2 Cor. iv. 14; v. 1. etc.

[2] Cf. Gilbert, *The Student's Life of Paul* (1899).

[3] 1 Cor. xv. 44, 49 f.

[4] 2 Cor. iii. 18; cf. iv. 6, and Philip. iii. 21.

ness, and his naturally meditative and visionary disposition will assist in an explanation of what took place, these facts must not be thrown out of court, even if their assistance require to be supplemented from another quarter. The rationalistic critic declares that these conditions explain the whole matter; with equal one-sidedness the defender of the traditional faith affirms that nothing short of a marvellous and stupendous miracle could have led to Paul's Christophany and conversion. In point of fact, neither the merely naturalistic hypothesis alone nor the supposition of a supernatural marvel alone is a satisfying explanation.

It is a serious mistake to judge Paul's Christophany solely according to our Western standards of thought and character. Paul's Orientalism entered into the very fabric of his being. And again, his chronological position in the relative progress of the race must never be lost sight of. Truth must ever be revealed (or discovered) under the necessary limitations of time and place and individual development. Is it religious truth alone which requires a miracle for its revelation? Or is the religious genius exempt from the laws of the human intellect, so that he must have a special dispensation of miraculous guidance? And when the revelation comes to him, are the natural means of communication so insufficient that only the extraordinary and inexplicable channels are available? Paul was a religious genius whose conversion was due to the intuitive comprehension of a great ethical truth, namely that his career of inquisition was a violation of his own best instincts, and that there was a law within more sacred than the external legalism which he was seeking to defend. This truth he perceived suddenly, intuitively, or to express the matter differently, he had an ethical and religious revelation from heaven. Both forms of expression are admissible; they are not mutually exclusive, for they merely state the two sides of one and the same truth. In what form should this revelation come to him? Let us remember that Paul was an Oriental, a Jew, a Pharisee, trained in the mysticism of his ancestral religion, immersed in the current philosophy and theology, and limited by the stage of development which the race had up to that time reached. The answer must depend in every case upon the individual. In our case it might be simple conviction; in Paul's case Christ himself appeared before the persecutor in a glorious body of light.[1]

The distinction between vision and apparition is fully justified by the results of the most recent scientific research, which show unquestionably that there is an actual connection of some sort between the objective fact and the perception of that fact through an apparition where its perception through the senses cannot be supposed; and, moreover, that this connection is not due to chance.[2] Such apparitions, therefore, are not merely subjective visions originating in the mind of the

[1] Cf. Pfleiderer, *Paulinismus*.

[2] For instance, a census of such coincidental apparitions (many of the cases having been recorded before they were verified) showed that the number of coincidences was 350 times greater than the law of chance required. See Hyslop, "Results of Psychical Research," *Harper's Monthly*, April, 1900.

percipient; on the other hand, by some means we know not what, they are due to the operation of the mind of another. When Paul fell prostrate on the road to Damascus, he was conscious of being in the presence of a personality which transcended his own, the man whose name he had been persecuting, and who now stood before him as one from the dead, yet with all the appearance of objective reality. The visible manifestation was coincidental with Paul's conversion, yet not the cause of it, since we have already found the cause to have been ethical and not objective. This coincidence was not due to chance; there was a connection between the apprehension of the ethical truth and the experience of the visible manifestation. In other words, there was an apparition of an actually existent personal being. But at this point the objection will be raised that if the visible manifestation was not the cause of the ethical intuition, then the latter was the cause which produced the visible manifestation. We gladly admit this possibility, for we have just seen that there was a connection between the two events which was not due to chance, and now the nature of the connection becomes apparent. The intuition of ethical truth took on objective form and appeared to Paul as a visible manifestation. What then becomes of the evidence just adduced for the presence of an actually existent personal being other than Paul's self? The answer is quite clear: that evidence consists not in the visible manifestation but in the ethical intuition, whose source was the Author of truth. And once more, if it is objected that this is a mere play of words which leads us back to the simplest form of the vision hypothesis of a visible manifestation conjured up from the depths of Paul's own mind, we again acknowledge the fairness of the objection and at once declare our willingness to accept the vision hypothesis in its simplest form, but on one condition, namely that the origin of Paul's ethical intuition as coming from a divine personality be left undisputed. In that case, however, the appropriate term for the visible manifestation is not vision but apparition. The distinction is between the pantheistic and the theistic interpretations of the event.

After a life-long study of the problem of Paul's conversion, that keen-minded critic and rationalist Baur declared that the event was "a marvel whose inner mystery no dialectic or psychological analysis could explain." And even Renan has admitted that if Paul's conversion "was not a miracle in the old traditional meaning of the word, it remains a psychological problem forever insoluble by us of to-day." But happily the problem did not rest with the conclusions of Baur and Renan; for to-day it is neither a miracle nor an insoluble mystery. The apparition hypothesis[1] in which we find the ultimate solution accords not only with the testimony of the Biblical documents but also with a wider view of the nature of the "world ground" and of the method of divine revelation. Moreover, the same hypothesis will account fully for the previous appearances of the risen Lord to the

[1] The so-called "theistic vision" hypothesis, advocated by Lotze, Schweizer, and others.

disciples. It was no ordinary mortal whose life-blood had been poured out upon the summit of Calvary. To Peter and his companions the very idea of Jesus's death had been inconceivable;[1] and after the crucifixion they realised intuitively from their total impression of that tremendous personality that he was still alive, that he must in the very nature of the case triumph over death. In other words, this truth came to them as a divine revelation. As in Paul's case, the basis of this revelation was distinctly ethical. As in Paul's case the revelation (or intuition) took the form made necessary by the current modes of thought. Both with the disciples and with Paul the great spiritual truth was of necessity clothed in the imagery of Jewish theology. Acknowledged now as Messiah both by the disciples and by Paul, Jesus could not, according to their thought, remain in Sheol: with such a man death must be but the gateway into life. So overwhelming was this realisation that Jesus himself seemed to stand before them, visible to the eye of sense; an angel or spirit could be no longer supposed, and the bodily resurrection of Jesus was accepted and became the dogma of the primitive Church. And this is neither a mystery nor a miracle, since the apparitions came on the basis of psychological conditions which were undoubtedly present and can be clearly traced, and they came in striking harmony with the usual manner of apparitions as now beginning to be known to science through the data of hundreds of recorded instances.[2]

It has been argued that the two simultaneous acts, the one by Paul, the other by the spirit, were either interdependent or independent; that in the first case the Spirit caused Paul's conversion, and that in the second case the coincidence of the events was miraculous, so that we have a miracle in either case.[3] Let us acknowledge that the events were interdependent, and that Paul's conversion was the work of the Spirit; but that it was a miracle, or in any wise out of harmony with recognised natural laws, cannot be demonstrated. And when it is urged that a visible apparition was bound to be in a certain sense objective since it involved the activity of the visual centres of the brain in order to the production of the optical illusion, and that the production of such an activity was as much a miracle as the presentation of a material form before the eyes would have been, we must again dissent, on the ground that the natural process of intuition (or revelation) involves brain activity and yet is not a miracle; and the activity of the visual brain centres is no more miraculous than that of the higher intellectual and moral centres.

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[1] Matt. xvi. 22.

[2] One of the most clearly recognised principles in this connection is that such apparitions are in large part the creation of the mind of the percipient on the basis of a suggestion or of an intuitive apprehension of some truth not perceived through the material senses. In Paul's case this truth was the messiahship of Jesus; with the disciples it was Jesus's triumph over death; in each instance it was an ethical intuition on their part, an act of revelation on the part of the Absolute Personality.

[3] Massie, *Expositor*, Third Series, Vol. X., 1889.

But finally, we should not pass unnoticed the apologetic objection to the apparition hypothesis, that it makes God, or Christ, the author of a sort of optical delusion, so that the Church with its hope of immortality was founded upon a lie. The objection is really of little moment. The Church with its hope of immortality was founded upon an ultimate reality—the personality of Jesus. The essential fact about the resurrection was that Christ had risen in final triumph over death. That this spiritual triumph was conceived of in very material fashion was a necessary incident of the times, a natural outcome of Jewish and popular thought, and not a part of the spiritual truth which came from God. As to what became of the material body of Jesus, let us acknowledge frankly that we do not know. Its removal by others without the knowledge of the disciples, or a mistake as to the tomb, or the immediate departure of the sorrowful company to Galilee—events such as these are not accidents but come to pass under the guidance of an all-wise Providence. And when Steude argues that the apparitions could not have resulted from a syllogism about the empty tomb in combination with the Jewish resurrection belief, but only from an actual experience with the mutilated body of the risen Lord, we grant that his argument might be just but for the omission of that great prime factor, the personality of Jesus himself. This, in the last analysis, was the basis of the divine revelation which came to the disciples and to Paul; and the manner of the revelation accorded fully with the intellectual and spiritual development of those to whom it came. All truth is a progressive revelation; in the course of time the hope of immortality has come to rest upon larger inductions than were possible to primitive Christianity.

ARTHUR BUMSTEAD.

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BOOK REVIEWS.

THE VARIETIES OF RELIGIOUS EXPERIENCE; A STUDY IN HUMAN NATURE. Being the Gifford Lectures Delivered at Edinburgh in 1901–1902. By *William James, LL. D.*, etc., Corresponding Member of the Institute of France and of the Royal Prussian Academy of Sciences, Professor of Philosophy at Harvard University. New York, London, and Bombay: Longmans, Green, and Co. 1902. Pages, xii, 534.

Professor James remarks in the opening lines of his preface: "This book would never have been written had I not been honored with an appointment as Gifford Lecturer on Natural Religion at the University of Edinburgh;" and the world therefore owes a debt of gratitude to that institution for the admirable production which lies before us. Few persons are better qualified than the author, by range of philosophic insight and human sympathy, to describe man's religious constitution. The work is brilliant at every turn, and the natural gloom of the subject has everywhere been lightened by flashes of wit and humor. Differ as one may from certain of the author's conclusions, or regarding his generous attitude towards the aberrancies of psychical research, one cannot help paying to this work the tribute of admiration that belongs to every classical expression of psychological inquiry.

It had been Professor James's original intention to give two distinct courses of lectures,—one descriptive, on man's religious appetites, and the other metaphysical, on their satisfaction through philosophy; but the unexpected growth of his material resulted in the second subject being postponed entirely, the description of man's religious constitution now filling the twenty lectures. The author has not omitted, however, to suggest his philosophic conclusions in a brief postscript. He hopes some day to be able to express them in more explicit form.

Professor James believing that greater wisdom lies in a large acquaintance with particular facts has, in his discussions, wisely eschewed abstractions; and has "loaded" his lectures with concrete examples "chosen among the extremer expressions of the religious temperament." His purpose in so doing has not been to offer a caricature of the subject, which may be the impression gained by some readers, nor to afford material for amusement, which in some cases he involun-

tarily does, but to obtain a sound basis of religious actuality to work upon, and all will join him in the belief that in the end his procedure has been justified. We shall consider in detail a few of the points which he has raised.

At the outset, Professor James makes an important distinction,—one which is commonly ignored. It is the distinction between questions of fact and questions of value. This is the logical distinction between the two orders of inquiry concerning constitution, origin, and history on the one hand, and importance, meaning, and significance on the other, the answer being given to the first in an *existential judgment* or proposition and that to the second in a proposition of value, or *spiritual judgment*. He says: "In the matter of religions it is particularly easy to distinguish the two orders of question. Every religious phenomenon has its history and its derivation from natural antecedents. What is nowadays called the higher criticism of the Bible is only a study of the Bible from this existential point of view, neglected too much by the earlier Church. Under just what biographic conditions did the sacred writers bring forth their various contributions to the holy volume? And what had they exactly in their several individual minds, when they delivered their utterances? These are manifestly questions of historical fact, and one does not see how the answer to them can decide offhand the still further question: of what use should such a volume, with its manner of coming into existence so defined, be to us as a guide to life and a revelation? To answer this other question we must have already in our mind some sort of a general theory as to what the peculiarities in a thing should be which give it value for purposes of revelation; and this theory itself would be what I just called a spiritual judgment. Combining it with our existential judgment, we might indeed deduce another spiritual judgment as to the Bible's worth. Thus if our theory of revelation-value were to affirm that any book, to possess it, must have been composed automatically or not by the free caprice of the writer, or that it must exhibit no scientific and historic errors and express no local or personal passions, the Bible would probably fare ill at our hands. But if, on the other hand, our theory should allow that a book may well be a revelation in spite of errors and passions and deliberate human composition, if only it be a true record of the inner experiences of great-souled persons wrestling with the crises of their fate, then the verdict would be much more favorable. You see that the existential facts by themselves are insufficient for determining the value; and the best adepts of the higher criticism accordingly never confound the existential with the spiritual problem. With the same conclusions of fact before them, some take one view, and some another, of the Bible's value as a revelation, according as their spiritual judgment as to the foundation of values differs."

As will be seen, the Professor is at once prepared to do justice to both sides of the question without damaging anyone's feelings.

Next, the neurological ground is cleared, and the medical materialism that seeks to undermine all the extremer forms of religious expression demolished.

The author describes the doctrine as follows: "Medical materialism finishes up Saint Paul by calling his vision on the road to Damascus a discharging lesion of the occipital cortex, he being an epileptic. It snuffs out Saint Teresa as an hysteric, Saint Francis of Assisi as an hereditary degenerate. George Fox's discontent with the shams of his age, and his pining for spiritual veracity, it treats as a symptom of a disordered colon. Carlyle's organ-tones of misery it accounts for by a gastro-duodenal catarrh. All such mental over-tensions, it says, are, when you come to the bottom of the matter, mere affairs of diathesis (auto-intoxications most probably), due to the perverted action of various glands which physiology will yet discover." The refutation of medical materialism is as follows: "Modern psychology, finding definite psycho-physical connections to hold good, assumes as a convenient hypothesis that the dependence of mental states upon bodily conditions must be thorough-going and complete. If we adopt the assumption, then of course what medical materialism insists on must be true in a general way, if not in every detail: Saint Paul certainly had once an epileptoid, if not an epileptic seizure; George Fox was an hereditary degenerate; Carlyle was undoubtedly auto-intoxicated by some organ or other, no matter which,—and the rest. But now, I ask you, how can such an existential account of fact of mental history decide in one way or another upon their spiritual significance? According to the general postulate of psychology just referred to, there is not a single one of our states of mind, high or low, healthy or morbid, that has not some organic process as its condition. Scientific theories are organically conditioned just as much as religious emotions are; and if we only knew the facts intimately enough, we should doubtless see 'the liver' determining the dicta of the sturdy atheist as decisively as it does that of the Methodist under conviction anxious about his soul. When it alters in one way the blood that percolates it, we get the Methodist, when in another way, we get the atheist form of mind. So of all our raptures and our drynesses, our longings and pantings, our questions and beliefs. They are equally organically founded, be they of religious or of non-religious content."

We cannot forbear also quoting here the refutation which the author offers of the theory that religion is a species of perverted sexuality: "It reminds one, so crudely is it often employed, of the famous Catholic taunt, that the Reformation may be best understood by remembering that its *fons et origo* was Luther's wish to marry a nun:—the effects are infinitely wider than the alleged causes, and for the most part opposite in nature. It is true that in the vast collection of religious phenomena, some are undisguisedly amatory—e. g., sex deities and obscene rites in polytheism, and ecstatic feelings of union with the Saviour in a few Christian mystics. But then why not equally call religion an aberration of the digestive function, and prove one's point by the worship of Bacchus and Ceres, or by the ecstatic feelings of some other saints about the Eucharist? Religious language clothes itself in such poor symbols as our life affords, and the whole organism gives overtones of comment whenever the mind is strongly stirred to expression.

Language drawn from eating and drinking is probably as common in religious literature as is language drawn from the sexual life. We 'hunger and thirst' after righteousness; we 'find the Lord a sweet savor'; we 'taste and see that he is good.' 'Spiritual milk for American babes, drawn from the breasts of both testaments,' is a sub-title of the once famous New England Primer, and Christian devotional literature indeed quite floats in milk, thought of from the point of view, not of the mother, but of the greedy babe."

In the second lecture, the topic to be studied is circumscribed. Religion is defined arbitrarily to mean "the feelings, acts, and experiences of individual men in their solitude, so far as they apprehend themselves to stand in relation to whatever they may consider divine." What this "divine" is remains in each case for interpretation, as for example in atheistic Buddhism and transcendental idealism. Dire necessity confronts us in our conduct; renunciation is the price of life.

> "'Entbehren sollst du! sollst entbehren!
> Das ist der ewige Gesang
> Der jedem an die Ohren klingt,
> Den, unser ganzes Leben lang
> Uns heiser jede Stunde singt.'

"For when all is said and done, we are in the end absolutely dependent on the universe; and into sacrifices and surrenders of some sort, deliberately looked at and accepted, we are drawn and pressed as into our only permanent positions of repose. Now in those states of mind which fall short of religion, the surrender is submitted to as an imposition of necessity, and the sacrifice is undergone at the very best without complaint. In the religious life, on the contrary, surrender and sacrifice are positively espoused: even unnecessary givings-up are added in order that the happiness may increase. Religion thus makes easy and felicitous what in any case is necessary; and if it be the only agency that can accomplish this result, its vital importance as a human faculty stands vindicated beyond dispute. It becomes an essential organ of our life, performing a function which no other portion of our nature can so successfully fulfill. From the merely biological point of view, so to call it, this is a conclusion to which, so far as I can now see, we shall inevitably be led"

Then, in successive chapters, replete with clever descriptions and analyses of concrete cases, Professor James treats of "The Reality of the Unseen," "The Religion of Healthy-Mindedness," "The Sick Soul," "The Divided Self, and the Process of Its Unification," "Conversion," "Saintliness," and "Mysticism." Lastly, the philosophical side of the subject is indicated. In religion, the primacy is that of feeling; philosophy is a secondary function, unable to warrant faith's veracity. Conceptual processes can class facts, define them, interpret them; but they do not produce them, nor can they reproduce their individuality. There is a plus, a thisness, which feeling alone can answer for. "In all sad sincerity," says Professor James, "I think we must conclude that the attempt to demonstrate

by purely intellectual processes the truth of the deliverances of direct religious experience is absolutely hopeless."

But there is one task that philosophy *can* perform for religion. "If she will abandon metaphysics and deduction for criticism and induction, and frankly transform herself from theology into science of religions, she can make herself enormously useful. . . . Sifting out unworthy formulations, she can leave a residuum of conceptions that at least are possible. With these she can deal as *hypotheses*, testing them in all the manners, whether negative or positive, by which hypotheses are ever tested. She can reduce their number, as some are found more open to objection. She can perhaps become the champion of one which she picks out as being the most closely verified or verifiable. She can refine upon the definition of this hypothesis, distinguishing between what is innocent over-belief and symbolism in the expression of it, and what is to be literally taken. As a result, she can offer mediation between different believers, and help to bring about consensus of opinion. She can do this the more successfully, the better she discriminates the common and essential from the individual and local elements of the religious beliefs which she compares. I do not see why a critical Science of Religions of this sort might not eventually command as general a public adhesion as is commanded by a physical science."

We conclude with the author's general characterisation of religion. Summing up in the broadest possible way the criteria of the religious life, Professor James finds that it includes the following beliefs:

"1. That the visible world is part of a more spiritual universe from which it draws its chief significance;

"2. That union or harmonious relation with that higher universe is our true end;

"3. That prayer or inner communion with the spirit thereof—be that spirit 'God' or 'law'—is a process wherein work is really done, psychological or material, within the phenomenal world.

"Religion includes also the following psychological characteristics:

"4. A new zest which adds itself like a gift to life, and takes the form either of lyrical enchantment or of appeal to earnestness and heroism.

"5. An assurance of safety and a temper of peace, and, in relation to others, a preponderance of loving affections." *μ.*

FRAGMENTS IN PHILOSOPHY AND SCIENCE; BEING COLLECTED ESSAYS AND ADDRESSES. By *James Mark Baldwin*, Ph. D. Princeton, Hon. D. Sc. Oxon, LL. D. Glasgow, Stuart Professor in Princeton University. New York: Charles Scribner's Sons. 1902. Pages, xii, 389. Price, $2.50.

Dr. Baldwin has rescued in this volume certain fugitive pieces on philosophy, psychology, and life that would otherwise have dwelt in the oblivion of the periodical literature to which they were originally consigned. Their titles are: I. Phi-

losophy: Its Relation to Life and Education; II. The Idealism of Spinoza; III. Recent Discussion in Materialism; IV. Professor Watson on Reality and Time; V. The Cosmic and the Moral; VI. Psychology Past and Present: VII. The Postulates of Physiological Psychology; VIII. The Origin of Volition in Childhood; IX. Imitation: A Chapter in the Natural History of Consciousness; X. The Origin of Emotional Expression; XI. The Perception of External Reality; XII. Feeling, Belief, and Judgment; XIII. Memory for Square Size; XIV. The Effect of Size-Contrast Upon Judgments of Position in the Retinal Field; XV. An Optical Illusion; XVI. New Questions in Mental Chronometry; XVII. Types of Reaction; XVIII. The "Type-Theory" of Reaction; XIX. The Psychology of Religion; XX. Shorter Philosophical Papers; XXI. Shorter Literary Papers.

The essays cover a period of fifteen years, and were unfortunately omitted from the author's more deliberate publications. Dr. Baldwin has seen in them a philosophical unity which has demanded utterance. He says: "The group of philosophical essays are introductory to a developed view of the world. The critical and historical papers naturally stand more squarely on their own feet; yet they too walk in a direction, and carry their own signboards. The strictly experimental studies, on the other hand, give results which in so far justify their own presence here either as contributing something to their respective topics, or as announcing ideas which have proved in some small way fruitful in the later literature." He then grapples with the subject of signboards, fondles it, and summarises his philosophy as follows: "Now another signboard,—a personal signboard! My best thought of nature, my type of philosophy, is an Idealism which finds that the universe of science is, when all is said, a cosmos which is not only true but also beautiful, and in some sense good. Science tells us what is true; that is science's prerogative: and whatever may be science's final word about Nature, that word is in so far the truth of the matter. Philosophy then enters her questions: how can such truth be also good, beautiful, livable—or none of these? While others say other things, and many others many other things, I say—using the liberty of this preface—it is true and good *because it is beautiful.* Nothing, I think, can be true without being beautiful, and nothing can be, in any high sense, good without being beautiful. In the words of my colleague and friend Professor A. T. Ormond (*Foundations of Knowledge*, p. 228) 'the æsthetic principle is at the same time a demand and an intuition....an ideal requirement and an intuition under which our world completes itself....It represents the point in our conceptions where worth and truth coalesce and become one.'

"The ascription of beauty, a reasoned, criticised, thought-out ascription of æsthetic quality, is the final form of our thought about nature, man, the world, the All. Let this be our sign-board,—vague-seeming as it is!" *μ.*

PSYCHOPATHOLOGICAL RESEARCHES: STUDIES IN MENTAL DISSOCIATION. With Text Figures and Ten Plates. By *Boris Sidis, M. A., Ph. D.* Director

of the Psychopathological Laboratory. Published under the auspices of the trustees of the Psychopathic Hospital. Department of the New York Infirmary for Women and Children. New York: G. E. Stechert. 1902. Pages, xxii, 329.

The present work consists of a series of investigations undertaken with the object of studying the problems presented by the phenomena of functional psychosis. The author has selected six typical cases. The first study is concerned with the phenomena observed in dissociative states of functional psychosis, where attempts are made to bring about a synthesis of subconscious dissociate systems: and methods are here worked out to obtain subconscious reactions to stimulations. The results, the author declares, clearly reveal the nature of the phenomena in question. "Psychologically, functional psychosis is coextensive with the whole domain of the subconscious. Physiologically, functional psychosis is correlated not with organic neuron degeneration, but with functional disaggregation of whole systems of neuron-aggregates. In functional psychosis, the function apparently lost and destroyed is found to be present in the subconscious,—the loss of function is purely dissociative. The activity is preserved and the system is really unaffected, —it is only dissociated from other functioning systems." The second study deals with alcoholic amnesia and the bringing out of subconscious memories. The result of this investigation is that amnesia in general and alcoholic amnesia in particular does not necessarily imply a state of unconsciousness. The third study "traces the growth and development of a *persistent* dissociated subconscious system and the disturbances brought about by its *periodic eruptions* into the upper strata of mental life." The fourth study discusses phenomena of mental dissociation in depressive delusional states. The fifth is on mental dissociation in a case presenting limited psychomotor disturbances. The last study, on dissociated states of psychomotor epilepsy, "deals with the growth and development of a whole system presenting psychomotor disturbances apparently of an epileptic character."

The researches of Dr. Sidis are of great importance to the psychopathologist and psychiatrist, and not without a very extensive bearing on psychological problems proper. They also afford an excellent insight into the nature and methods employed in psychopathological investigations.

The index and the various plates are good, as is also the letter press. *μ.*

The Elements of Mind; Being an Examination Into the Nature of the First Division of the Elementary Substances of Life. By *H. Jamyn Brooks.* New York and Bombay: Longmans, Green & Co. 1902. Pages, xviii, 312.

Mr. Brooks has the firm conviction that he is able "to take the student of nature, whatever science he may be interested in, into fresh fields of experimental research, wherein, by a fortuitous train of thought," he believes he has "discovered the elements of mind, which, when compounded with those of Force and Matter, constitute the mysterious substance we call life." He was encouraged by Professor

William James and Dr. J. Beattie Crozier "to overcome the diffidence which otherwise would have prevented him courting publicity for ideas which are, perhaps, antagonistic to those of some of the profoundest thinkers the world has produced." Proceeding upon the observation that the majority of human vices are but virtues carried to extremes, and that consequently the impulses which initiated them must be natural and therefore wholesome, he declares that the elementary impulses leading to the vices are necessary in the formation of the perfect man, and that the virtues in their turn are nothing more than mere vicious impulses under the restraint of moderation. For example, thrift may become parsimony and even miserliness and avarice, liberality may become extravagance, pride arrogance, self-respect vanity, etc. "These curious developments show that the impulses leading to good and evil climaxes respectively, are not necessarily antagonistic, and that both are necessary in the perfect man,—that, in fact, a man with all good, and only good, impulses (as the world understands them) would be unfitted for practical life." The author then discovered that all the virtues and vices were of a complex nature when fully developed, but taking any individual virtue or vice in its emotional aspect, and tracing it backwards, that it became less complex, and indeed, in its first stage as an initial prompting, was of the simplest character. "The hypothesis then presented itself that these individual initial promptings, leading in every instance to a distinctive emotion, constituting the resultant virtue or vice, as the case might be, are the elements of Mind....If these really be the elements of Mind, then it seems to me that when they join with those of matter and force, they must constitute the elements of life, and that, consequently, the missing link at last is found."

This, then, is the gist of Mr. Brooks's investigations. The elements of matter have been numbered and named, and the elements of physical force are also partly known; but with regard to the elements of mind, apart from the other divisions of force and matter, it does not seem, as the author says, that it has ever been suggested that they exist.

Summarising, he says: "My hypothesis is, that life is a compound or commonwealth, of these elements of mind, allied with the elements of matter and the elements of physical force.

"And that the elements of mind like those of matter and force are actual technical elementary substances." μ.

STUDIES IN POLITICAL AND SOCIAL ETHICS. By *David G. Ritchie, M. A., LL. D.*, Professor of Logic and Metaphysics in the University of Saint Andrews; Late Fellow and Tutor of Jesus College, Oxford. London: Swan Sonnenschein & Co., Ltd. New York: The Macmillan Co. 1902. Pages, ix, 238. Price, $1.50.

Dr. Ritchie has collected in this volume certain articles on ethical topics which he has published at considerable intervals of time in the *International Journal*

of Ethics and *The Contemporary Review*, together with addresses on similar subjects delivered before the Co-operative Wholesale Society and the South Place Ethical Society of Finsbury. He reminds his readers that they are "exoteric discourses," as distinguished from technical esoteric inquiries. "It seems to me possible," he says, "to discuss practical questions of political and social ethics on the basis of what may be called evolutionary utilitarianism, without raising, or at least without discussing, metaphysical questions, provided that one may take for granted that faith in the value and meaning of human society and human history which is implied in all serious political and social effort. I hold, indeed, that a thoroughly scientific treatment of ethics is impossible without a philosophical basis; and that this faith, of which I have spoken, in the ultimate rationality of the world can only find a theoretical justification in a metaphysic or, in the Aristotelian phrase, in a theology."

In the first paper, he has considered the light which biological theories of evolution throw upon the history of human society and on the practical problems of human society. In the second lecture, he has discussed the question of political equality; in the third, that of law and liberty, or state interference; in the fourth, civic duties and party politics; in the fifth, the ethical value of the commemoration of past events; in the sixth, the problems of war and peace; in the seventh, the ultimate value of social effort; and in the eighth and last, the time-honored problem of free will and responsibility.

The author's views have everywhere been clearly and accurately stated, and will be found to be remunerative reading. *μ.*

THE PROBLEM OF METAPHYSICS AND THE MEANING OF METAPHYSICAL EXPLANATION. An Essay in Definitions. By *Hartley Burr Alexander, Ph. D.*, Sometime Fellow in Philosophy, Columbia University. Columbia University Contributions to Philosophy, Psychology, and Education. Vol. X., No. 1. New York: The Macmillan Co. Berlin: Mayer & Müller, Markgrafenstrasse. 1902. Pages, 130. Price, 75 cents.

On the assumption that most of our differences in matters metaphysical are misunderstandings and due to our failing to apprehend one another's meanings, it has been the endeavor of the author of the present brochure to overhaul thoroughly our principal metaphysical concepts and to submit them to critical analysis and scrutiny. The subjects he has considered are such as the following: The Meaning of Knowledge, The Object of Knowledge, Explanation and Description, The Principle of Identity, The Principle of Causality, The Principle of Sufficient Reason, Truth and Its Criteria.

The book is thus essentially a study of terms. "It endeavors," in the words of the author, "to define our more elemental metaphysical concepts, and to show some shades of meaning conveyed by the words we use, aspects we might emphasise, distinctions we should render clear. But in this the author does not attempt

encyclopædic lexicography: it is not his purpose to give exhaustive definition nor full historical exposition of the meaning of any term. It is only for method that the essay proceeds by definition; its purpose is to outline as clearly as possible the central problem and import of all metaphysic, and for the accomplishment of this no method is likely to prove so fruitful as the Aristotelian study of concepts. But it must not be understood that there is any endeavor at metaphysical construction. In all ways effort has been directed to the avoidance of this....No final metaphysical solution is possible, because so long as human intelligence broadens metaphysical truth must alter. It is not independent nor static, but exists for knowledge alone." μ.

THE PSYCHOLOGICAL INDEX, No. 8. A Bibliography of the Literature of Psychology and Cognate Subjects for 1901. Compiled by *Howard C. Warren*, Princeton University, with the co-operation of J. Larguier des Bancels, Paris, Leo Hirschlaff, Berlin, Charles D. Isenberg, New York, and W. H. R. Rivers, Cambridge (Eng.). New York: The Macmillan Company. Pages, viii, 206.

The Psychological Index is now published not only as part of the *Psychological Review*, but also as a bibliographical supplement to Professor Baldwin's *Dictionary of Philosophy and Psychology*. This bibliography of psychological literature includes original publications in all languages, together with translations and new editions in English, French, and German. The many subjects cognate to psychology are catalogued, viz., anatomy and physiology, pathology, anthropology, criminology, general philosophy, etc. Two thousand nine hundred and eighty-five titles of books and articles are listed,—a number from which some conception may be gained of the extent of the annual literature of this department. μ.

RESEARCHES ON THE RHYTHM OF SPEECH. By *J. E. Wallace Wallin, Ph. D.*, Reprinted from Vol. IX. (1901) of the Studies from the Yale Psychological Laboratory. Yale University, New Haven, Conn. 1902. Pp., 142. Price, $1.00.

Dr. Wallin has presented in this brochure a very painstaking and exhaustive analysis of the rhythm of poetry. He first cursorily reviews the work done by his predecessors in determining experimentally the time relations of speech, and shows that improved methods of speech investigation are imperatively necessary. He adds: "Two types of methods may be used. The former is largely the method which has prevailed up to the present time. The sounds of spoken language have been measured by means of finger beats, currents of air, and non-reproducible sound vibrations. A more direct method consists in measuring directly the sounds recorded in, and reproduced by, a talking machine." The experiments based on these methods were begun in the early summer of 1900 and carried out in the academic year of 1900–1901.

The theoretical and critical burden of his investigation is contained in the concept of the "Centroid." Any portion of speech such as "the cities are full of pride," is physically a vibratory movement of a complicated form of which various portions can be assigned in succession to different sounds, with more or less abrupt changes (glides) between them. This series of sounds represents: "(1) a continuous succession of vocal movements representing work, (2) a continuous vibration of an air particle, (3) a continuous succession of sensations. Both the speaker and the hearer feel the recurrence of points in the succession at which the impression reaches a maximum. These maxima are felt to have their positions determined, not only by the actual maxima of vocal effort and of acoustic impression, but also by the preceding sounds and by the anticipation of following ones. Owing to these circumstances, the maxima as felt may differ more or less from the actual vocal or acoustic maxima. Such a maximum of effect may be called a 'centroid.'"

Considering a poetical line as a certain quantity of speech-sound distributed so as to produce an effect equivalent to that of a certain number of points of emphasis at definite intervals, the location of the point of emphasis becomes the thing to be determined, and it is determined by the strength of the sounds at and around it. This point of emphasis is like the centroid of a system of forces. The centroid is thus not a syllable nor a single sound, but a point in the course of a sound (Scripture). The methods of locating the centroid are then developed, the elements and the essence of the centroid indicated, and the principles applied to various selections from English, Swedish, Persian, and Japanese poetry, with results which will, in all likelihood, stagger poets, and at the precise value of which they will certainly wonder. *u.*

ZEITSCHRIFT FÜR ALLGEMEINE PHYSIOLOGIE. Herausgegeben von *Dr. Max Verworn*, Professor der Physiologie und Direktor des physiologischen Instituts an der Universität Göttingen. Erster Band. Erstes Heft. Mit 2 Tafeln und 4 Abbildungen im Text. Jena: Verlag von Gustav Fischer. 1902. Pages, 156. Price, per volume, 24 Marks.

Proceeding from the principles which have been laid down by him in his large and well-known work on *General Physiology*, Dr. Max Verworn has established the present *Zeitschrift für allgemeine Physiologie*, for the realisation of the general ideals which should control every department of research and thought. It is designed to be a trysting-place for inquirers in provinces connected with the biological sciences, being devoted to all the phases of that joint research which has to do with the investigation of the most general problems of life, and including the fields lying between physiology and anatomy, physiology and botany, etc. It will contain original researches, reviews, discussions, and similar topics. It will also have an international character. The present number, which is neatly got up, contains besides the introductory remarks by the editor, the following articles:

"Zur Kenntnis der Narkose," by Hans Winterstein, "Neue Versuche zur Physiologie der Befruchtung," by Emil Dungern, "Ueber die Reaktion des Blutserums der Wirbeltiere und die Reaktion der lebendigen Substanz im Allgemeinen," by Hans Friedenthal, and "Inanitionserscheinungen der Zelle," by Hans Wallengren.

The field of this periodical is a promising one, and from the contents and appearance of the first number it seems destined to fulfil the ideals which the editor has set himself. We wish it all success. *μ.*

NATÜRLICHE SCHÖPFUNGS-GESCHICHTE. Gemeinverständliche wissenschaftliche Vorträge über die Entwicklungs-Lehre. Von *Ernst Haeckel*, Professor an der Universität Jena. Zehnte verbesserte Auflage. Mit dem Porträt des Verfassers und mit 30 Tafeln, sowie zahlreichen Holzschnitten, Stammbäumen und Tabellen. Zwei Bände. Berlin: Druck und Verlag von Georg Reimer. 1902. Pages, lxxi, 368.

The fact that this popular and lucidly written work of Haeckel's has, in spite of the drawbacks for which it has been criticised, reached in thirty-four years its tenth edition of six thousand copies is at once proof of its sterling value and of the enduring interest of the public in the monistic doctrine of evolution. In literary quality and clearness Professor Haeckel's scientific exposition could hardly be excelled. It bears constantly on the broader philosophical problems and so never lags in interest. Adding to this the great skill shown by the author in the selection and construction of illustrations and diagrams, we may say that whatever the objections that have recently been raised to some of Professor Haeckel's personal scientific and philosophical theories, his work is destined to remain for a long time to come the most entertaining and most instructive natural history of creation. *μ.*

LES PHÉNOMÈNES ELECTRIQUES CHEZ LES ÊTRES VIVANTS. Scientia No. 13. Par *Maurice Mendelssohn*. Paris: C. Naud, Éditeur. 1902. Pages, 99. Price, 2 Francs.

MODE DE FONCTIONNEMENT ÉCONOMIQUE DE L'ORGANISME. Scientia No. 14. Par le *Dr. A. Imbert*, Professeur à la Faculté de Médecine de l'Université de Montpellier. Membre correspondant de l'Académie de Médecine. Paris: C. Naud, Éditeur. 1902. Pages, 97. Price, 2 Francs.

L'ÉLECTRICITÉ DÉDUITE DE L'EXPÉRIENCE ET RAMENÉE AU PRINCIPE DES TRAVAUX VIRTUELS. Scientia No. 19. Par *M.-E. Carvallo*, Docteur ès sciences agrégé de l'Université. Examinateur de mécanique a l'École Polytechnique. Paris: C. Naud, Éditeur. 1902. Pages, 91. Price, 2 Francs.

We have frequently before called attention to these admirable *résumés* of the present state of scientific inquiry regarding special topics in physics, mathematics, biology, etc., published under the collective name of *Scientia*. These little works are artistically and accurately got up, and are in every way worthy of the attention of the scientific public.

The first of the three books above listed is concerned with electrical phenomena among living organisms. It treats of the history of the subject, of the electrical phenomena of the muscles and the nerves, of electric phenomena in man, of the electric phenomena of the skin and the glands, of the electric phenomena of the nervous centers and the sensory organs, of electric fishes, electric phenomena in vegetables, the theory of electrogenesis in living beings, and concludes with some general considerations on the rôle played by electric phenomena in the manifestations of life. The author says that there are many uncertainties still regarding the question of the relation of animal electricity to the physico-chemical manifestations of the organism, yet he maintains it can be affirmed quite positively that the electric phenomena produced in the living organism result from nutritive functions of the cellular life and take part in the physico-chemical changes going forward in a living organism during activity and even rest. The electric energy which is found in living organisms and which reposes there in a potential state, enters into all the nutritive functions of the cellular life, and constitutes one of the forms of energy of which the organism is the producer and transformer. Therefore, this organic electricity must necessarily obey, at least within certain limits, the immutable law of the conservation of energy and the equivalence of forces. In this respect the electric phenomena common to animals and plants, the author concludes, conform to the principle of the fundamental unity of life.

In the second work. Dr. Imbert has considered the *economic functioning* of living organisms,—the ratio of the energy engendered to the total work accomplished. In machines this ratio is always less than unity. The difficulty of the investigation with organisms is that it is not easy to discover the precise nature of the organic motor. We know, however, from the researches of Chaveau, that in the animate motor this ratio is variable, though increasing according as the muscle or organ producing the energy acts under less contraction. It is impracticable for us to go into details; we can only say that the author has reached the conclusion that it is possible to realise *voluntarily* the conditions that correspond to a minimum expenditure of energy relatively to the nature and the form of the motor acting.

The third work, by Dr. Carvallo, is entitled *Electricity Deduced from Experiments and Reduced to the Principle of Virtual Velocities*. Admirable as the work of Maxwell may be, the author remarks, it is nevertheless obscure and its commentators have not sufficiently elucidated it. Therefore another mode of attack seems desirable, that of the mechanical interpretation of the experimental laws. The author has announced two fundamental principles which are generalisations of the two laws of Kirchhoff and which make the electric field a system with connections obeying the principle of virtual velocities. He has reverted, therefore, to rational mechanics in his explanations. But an electric system is not a system the freedom of which is finite, but an indefinite *milieu* analogous to an incompressible fluid in which ponderable bodies float with the ordinary connec-

tions of rational mechanics. The equations of these connections and the equations of the virtual velocities are, as above remarked, of two kinds: the first relating to the movements of matter on the one hand, and the second to electricity on the other. The equations relative to electricity are the two fundamental laws of which Kirchhoff has announced a special case,—the law of the incompressibility and the equilibrium of electro-motor forces throughout their entire confines. The other equations are the ordinary equations of rational mechanics. μ.

IGNATII ANTIOCHENI ET POLYCARPI SMYRNAEI EPISTULAE ET MARTYRIA. Edidit et adnotationibus instruxit *Adolfus Hilgenfeld*. Berolini: Sumtibus C. A. Schwetschke et Filii. 1902. Pages, xxiv, 384. Price, 10 Marks.

The present work is a complete annotated and critical edition of the letters and testimonials of Ignatius of Antioch and Polycarp of Smyrna. St. Ignatius died early in the second century, having, according to tradition, suffered martyrdom under Trajan. He is the reputed author of Epistles to the Ephesians, Romans, Magnesians, Philadelphians, and to Polycarp. Polycarp was the author of an epistle to the Philippians. The texts are mostly in Greek, and the learned and venerable editor, Dr. Adolf Hilgenfeld, has supplied a preface in Latin.

A new edition of *Webster's International Dictionary* has been announced by the G. & C. Merriam Company, of Springfield, Mass. An entirely new set of plates for the work has been made, for incorporating 25,000 additional words, phrases, and definitions. The volume contains 2365 pages and 5000 illustrations. For practical and rapid reference the new edition of *Webster's International Dictionary* retains its distinctive advantages.

ERRATUM.

The author of the book *Phantasien eines Realisten*, noticed in the April *Monist*, p. 478, was erroneously given as Irvin Bauer. The real author is Joseph Popper, a prominent engineer of Vienna. Mr. Popper's writings on ethical as well as scientific subjects are well known in Germany and Austria and are all distinguished for their philosophical insight and the perfection of their literary form.

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THE MONIST

APOLLONIUS OF TYANA.

A REFORMER of Greek religion from within, whose activity may have coincided with the first emergence of the Christian

APOLLONIUS OF TYANA.
Artistic restoration of the contorniate reproduced on page 162.
(Specially made for *The Monist*.[1])

propaganda from Judæa, is undoubtedly an interesting historical figure. And both in ancient and in modern times Apollonius of

[1] The hand which appears in the original has been omitted because of its inartistic effect.

Tyana has been made the subject of parallels which were probably never thought of by the author of his extant Life. The first of these parallels was by Hierocles, Proconsul of Bithynia under Diocletian; in which the attempt seems to have been made to show that the marvels attributed to Apollonius were better authenticated than those attributed to Christ. We do not possess this work itself; but we have the reply of Eusebius, Bishop of Cæsarea and ecclesiastical historian, written after the triumph of the new faith. The most elaborate modern parallel is that of F. C. Baur, first published in 1832.[1] Baur here attempts to show, not only that there are resemblances between the Life of Apollonius by Philostratus and the Gospels, but that Philostratus deliberately modelled his

APOLLONIUS OF TYANA.
A contorniate, and unquestionably authentic.[2]

hero on the type set forth by the Evangelists. Though he was followed in this view by Zeller, it is now generally rejected; so that there is no need to enter into controversy on the subject. It remains, however, none the less interesting to try to determine the character of the reforming activity of Apollonius himself. Was his predominant aim to conduct the world along the path of intensified supernaturalism, or was it to promote the growth of a more rational

[1] Republished by Zeller with two essays on related subjects under the general title, *Drei Abhandlungen zur Geschichte der alten Philosophie und ihres Verhältnisses zum Christenthum*, Leipzig, 1876.

[2] The medal shows on the obverse the philosopher's head, and on the reverse a victor on a quadriga with a palm in one hand and a whip in the other. The wrong spelling of uncommon words (in the present case TEANEYS for Tyaneus) is not unfrequent in numismatics. Reproduced from Visconti, *Iconogr.*. pl. 17, 4, fig. 115.

and ethical religion so far as this was possible without breaking with the past?

The materials for judging are contained in the Life of Apollonius written by Philostratus early in the third century, and in the extant letters ascribed to him, some of which Philostratus evidently knew. Whether any of these are genuine, it is impossible to be certain; and in any case the biography of Philostratus is clearly a romance. For the composition of it, the writer professes to have used the memoirs of Damis, a disciple of Apollonius; but he tells us that, as these were wanting in literary form, he has freely worked them up. Baur argues that the introduction of "Damis the Assyrian" is simply a literary device. The obvious anachronism by which Philostratus represents the Babylon visited by Apollonius as identical with the Babylon of Herodotus, he also holds to be intentional. It is not, he thinks, put before the reader for serious belief, but only to bring out the ideal attitude of a Greek philosopher confronted with Oriental ostentation. There is much to be said for this view. Philostratus, who was an accomplished man of letters, has nowhere the air of disclaiming credit for the skill of presentation shown in his narrative, while occasionally he disclaims belief in the stories narrated. He was, besides, an original art-critic, as is evident from the descriptions of real or imaginary pictures in another of his works; and he puts into the mouth of Apollonius æsthetic theories which he can scarcely have meant us to believe were not his own. He did not, of course, for a moment suppose that he was drawing up the documents of a new religion, and hence had no motive for concealing his methods. It was only necessary that they should not be obtruded. We have before us a highly mature work of literary art by an individual author who comes forward in his own name. If we cannot be sure in detail about the facts at the ground of the romance, we are saved from the labor of trying to extricate them from stratum on stratum of superimposed redactions. We know at least what type of reformer Philostratus conceived Apollonius to have been.

That Apollonius was a real person born at Tyana, there is no reason to doubt; nor is there any uncertainty about the general

character of his life and teaching. He was in manner of life a Neo-Pythagorean ascetic, and taught what would now be described as a spiritualistic philosophy. The one mode of reforming activity ascribed to him with absolute consistency is a vigorous campaign against animal sacrifices. Superhuman powers, especially those of prophetic insight and of clairvoyance, were attributed to him by common report. Dio Cassius,[1] as well as Philostratus, relates that he saw in a vision the slaying of Domitian. The fact that he had a quarrel with a Stoic philosopher named Euphrates, who is known as a historical personage,[2] is clear, though its causes can only be conjectured from the account of Philostratus. For the rest, there is no ground for supposing that Philostratus deviated in the general spirit of his representation from the authentic type of his hero; and he must have had sources of information open to him for the details, with whatever freedom he may have treated them. Other Lives of Apollonius, now lost, are known to have existed.

In the "Epistles of Apollonius," some of which, as has been mentioned, Philostratus had before him, the type is already individualised. A few points from these may be given as a preliminary to the more detailed biographical account which will follow.[3] The style of the most of them, it may be observed, is of the laconic brevity attributed by Philostratus to all the genuine letters of Apollonius. Two on the subject of sacrifices, addressed to the sacerdotal bodies at Olympia and at Delphi, may be quoted in full. "The gods need not sacrifices. What then might one gratify them by doing? By obtaining wisdom, as I think, and by benefiting worthy men to the extent of one's power. These things are dear to the gods; those are of the godless."[4] "Priests defile altars with blood; then some wonder whence cities are unfortunate, while

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[1] Lxvii. 18. See Baur, *Apollonius von Tyana und Christus* (*Drei Abhandlungen, etc.*, ed. Zeller, pp. 110–111).

[2] A laudatory reference to him in the Epistles of the younger Pliny (i. 10) is quoted by Baur, *loc. cit.*, p. 153*n*.

[3] The Epistles of Apollonius and the reply of Eusebius to Hierocles are appended to Kayser's edition of Philostratus, Vol. I. For Philostratus himself I have used Westermann's edition.

[4] Ep 26: τοῖς ἐν Ὀλυμπίᾳ Θεηκόροις.

they do ill in great things. Oh folly! Heraclitus was wise, but not even he persuaded the Ephesians not to wash out mud with mud."[1] The contrariety dwelt on between virtue and riches[2] may be passed over as a well-known philosophic commonplace; but the way in which love of family and country is brought into union with the widest cosmopolitanism seems to offer something distinctive of the philosopher who, having travelled over the known world, is said to have been always pleased when addressed by the name of his birthplace. While it is well, he declares, to think all the earth a fatherland and all men brothers and friends, as being children of God, of one nature; there being the same community of reason and of passions to each and all, barbarian or Greek: yet neither men nor even irrational animals can lose the memory of their home and native seat or find anything to replace it.[3] Men need cities next after the gods; and after the gods cities are to be honored and their interests to be placed foremost by every rational being.[4] While he accepts (or is made to accept) as an honor the charge that his Pythagorean philosophy seeks to attain insight into the future by revelations from the gods—only given, as he contends, to those who are pure in life—he also claims for the Pythagoreans, as Iamblichus did afterwards, the idea of a demonstrable religion.[5] Against the credulity of the time, we find the reproof addressed to the Milesians that, while Thales is called their father, they in their folly accuse a philosopher who predicts an earthquake of causing it.[6] A distinctive point again is the protest against the exaggerated cynical strain in Stoicism. In an imaginary dialogue, Euphrates is made to reproach Apollonius with relieving pains and sufferings of the body (which are no evil, according to the rigor-

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[1] Ep. 27: *τοῖς ἐν Δελφοῖς ἱερεῦσιν.*

[2] See especially Ep. 35: *Ἀρετὴ καὶ χρήματα παρ' ἡμῖν ἀλλήλοις ἐναντιώτατα, μειούμενον γὰρ τὸ ἕτερον αὔξει τὸ ἕτερον, αὐξανόμενον δὲ μειοῖ. πῶς οὖν δυνατὸν ἀμφότερα περὶ τὸν αὐτὸν γενέσθαι; πλὴν εἰ μὴ τῷ τῶν ἀνοήτων λόγῳ, παρ' οἷς καὶ ὁ πλοῦτος ἀρετή.*

[3] Ep. 44.

[4] Ep. 11.

[5] Ep. 52. Among the things received from a Pythagorean teacher, Apollonius mentions, besides mathematical and medical science, *γνῶσιν θεῶν, οὐ δόξαν, εἴδησιν δαιμόνων, οὐχὶ πίστιν.*

[6] Ep. 68.

ists). His answer is that the same charge might be brought against the god of healing.[1] Of actual miracles nothing is said; and one who could utter the fine gnomic saying, "To lie is unfree (characteristic of the unfree), truth is noble (characteristic of a noble nature)," cannot well[2] have been a counterfeiter of miraculous powers. A piece of practical advice that may be regarded as a refinement upon this occurs in a letter to a sophist on literary composition: "Since the absolutely best mode of speech is hard to determine, speak in your own character rather than try to imitate what is best—or what you suppose to be best—if you have it not by nature."[3]

One letter obviously different in style from the others[4] is nevertheless interesting as bearing the mark of the period though not of the individual ideas of Apollonius. At the end there is an expression of Stoic pantheism, which, in the transitional phase of the time, was often presented in fusion or confusion with Platonism. Everything done or suffered in appearance by the individual is to be referred to the one first essence (*πρώτη οὐσία*)[5] as its cause, both active and passive. The teaching of Apollonius himself, so far as we can judge, though not without Stoic elements, laid stress rather on the transcendence of the supreme divinity. In the earlier part of the letter, what is supposed to be the Platonic or Pythagorean doctrine of immortality is asserted. Death and birth alike are only appearance. There is alternation between the visible and tangible of nature (*φύσεως*) and the invisible and intangible of essence (*οὐσίας*), but in reality nothing is created or destroyed. The process is conceived as taking place by condensation and rarefaction of matter; the former being the phenomenon of birth and growth, the latter of death. As may be seen, there is here no strictly defined immateriality of the soul, which is either identified

[1] Ep. 8: *τοῦτό που καὶ πρὸς τὸν Ἀσκληπιὸν κοινὸν τὸ ἔγκλημα.*

[2] Ep. 83: *ψεύδεσθαι ἀνελεύθερον, ἀλήθεια γενναῖον.* This may have been a repudiation of the *γενναῖον ψεῦδος* permitted by Plato on occasion to his philosophic guardians of the State.

[3] Ep. 19. [4] Ep. 58.

[5] *ἡ δὴ μόνη ποιεῖ τε καὶ πάσχει πᾶσι γινομένη πάντα διὰ πάντων θεὸς ἀίδιος, ὀνόμασι καὶ προσώποις ἀφαιρουμένη τὸ ἴδιον ἀδικουμένη τε.*

with or very imperfectly discriminated from a fiery or ethereal influx such as the Stoics took to be the basis of life and thought. There seems to be nothing here specially characteristic of Apollonius; but it is clear that in the speculation of the time the Platonic metaphysic was in danger of being swamped in a kind of eclectic animism. The metaphysical advance to a definitely formulated immaterialism as regards the soul itself had to wait for the Neo-Platonic development. Neo-Platonism was in some respects a return from a religious to a more scientific interest in Plato; whose critique of materialism had not hitherto been carried through so rigorously in point of expression that the idea of incorporeal mind and soul could not again be lost.

With this later development we are not at present concerned; and in the teaching of Apollonius himself, as presented by Philostratus, there is abundant interest on the side both of thought and of practice. For the phase to which he belongs, if unoriginal metaphysically, was in other ways marked by advances that proved the still enduring vitality of the ancient culture. It was not indeed by intrinsic decay that that culture disappeared, but by the invasion of alien forces. In the third century it still seemed possible to preserve with modifications the inherited type. The method which commended itself to the minds that were still in the ascendant was that of conservative reform. The imperial monarchy, which no one now dreamed of abolishing, was to be made the centre of institutions as republican as possible in spirit. The ancient religions were to be preserved in some form of union under the ethical direction of philosophy. Oriental cults, severely opposed in the second century, were in the third regarded with more favor if only their underlying community with those of Greece and Rome could be brought into view. The movement found its precursors, both political and religious, in philosophers of the first century; among whom, as we shall see, Philostratus makes it his special aim to assign the place of honor to Apollonius. In more than one respect the philosopher of Tyana was a hero better adapted to the needs of the time than men whose activity had been more characteristic of their own age. Speculative minds were now decisively

turning away from Stoicism and seeking a more transcendental doctrine; and Apollonius had been a Pythagorean. The impracticable character of much of the Stoic resistance to monarchy during the first age of the empire was also recognised; and, while no philosophy would have been listened to that did not repudiate the language of political absolutism, the need was felt of one which laid little stress on the external form of government. This need too was supplied by a Platonising Pythagoreanism which, while it had no more sympathy than the other doctrines with Oriental kingship, assigned a high place among constitutions to a monarchy according to law. To us it is visible that the facts of the situation were making for a formal despotism, a monarchy by divine right, sanctioned by the theocratic Church, now rapidly growing under the surface of ancient life; but this at the time was seen or suspected by few. A still noble civilisation, lowered, as was confessed, in type though extended in range, but accompanied by many advances and possibilities of advance both administrative and spiritual, seemed to thinking men worth preserving against disruptive forces whether from without or from within.

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How far Philostratus was from insisting on the Oriental affinities of his hero may be seen at the opening of his first book where he begins with an apology for them. Some, it appears, refused Apollonius a place among philosophers precisely on the ground that he was said to have put forward his doctrine and discipline as revelations from the gods. Philostratus therefore sets himself to show that, in spite of all that can be urged on that ground, he was a sane and philosophical cultivator of true wisdom as understood among the Greeks. Earlier philosophers also were believed to have been enlightened by divine revelations; and not only Pythagoras himself, but Democritus and Plato and others, had frequented Eastern and Egyptian sages and priests: yet they were not suspected of "magic." His "dæmonic sign" is not brought as an accusation against Socrates. Anaxagoras made meteorological predictions; and these are looked upon as instances of his wisdom. Why then should similar predictions of the future

by Apollonius be ascribed to magical arts? Since, however, he is decried as a magician, and is not generally known in his true character, I have tried, says Philostratus, to bring together the facts from all accessible sources.

The memoirs of Damis, the disciple and companion of Apollonius, he proceeds to explain, were made known to the Empress Julia Domna (the wife of Septimius Severus) by a relation of Damis, and were committed by her to Philostratus, who was a member of her literary circle.[1] Damis, being an Assyrian by birth, was not a skilled writer;[2] but Philostratus has put into shape the materials supplied by him. These, we are to suppose, furnish the groundwork of the narrative.

The story begins with some legends about the birth of Apollonius, agreeably and romantically told. Before his birth he was announced to his mother by "Proteus, the Egyptian god," as an incarnation of himself. "The country people say that he was a son of Zeus, but he calls himself the son of Apollonius."[3] At the age of fourteen he was taken by his father to be instructed by a distinguished rhetorician at Tarsus. Disliking the luxury of the city, he was permitted to migrate to the neighboring Ægæ, where there was a temple of Asclepius. He gave attention to all the philosophies, but attached himself to that of Pythagoras. His Pythagorean teacher did not live according to the principles he taught; but Apollonius, while not ceasing to love his preceptor, aimed at practising the Pythagorean life in all its austerity. Beginning, as he said, like physicians, with discipline of the body, he gave up animal food, both as impure and as coarsening to the intellect. Wine also he gave up, not indeed as impure, but because it makes turbid the æther in the soul. He wore linen garments, rejecting those made from the skins or clothing of animals; went barefoot; let his hair grow long; and took up his abode in the temple. There, Philostrates relates, the god used to appear in person. Apollonius, with his approval, blames the offering beforehand of costly sacrifices, which seem to him to be in intention

[1] i. 3. [2] i. 19. [3] i. 6.

bribes; and bids the priest dismiss a wealthy suppliant, who is a wrongdoer, with his gifts. The gods, he observes, are most just, and will not consent to be bought off in this way. To another evil-minded suitor, he declines the office of mediator, telling him that the gods welcome the good without intermediaries.[1] When he had come of age, he returned to Tyana, having made the temple at Ægæ, says his biographer, a Lyceum and an Academy; for it resounded with all philosophy.

At home, he reformed a debauched elder brother; and when he received his patrimony, distributed most of it among his poor relations, reserving only a small portion for himself. Going beyond the famous precept of Pythagoras, that a man should be faithful to his wife, he resolved on a life of chaste celibacy, and kept his resolution even in youth. According to the Pythagorean rule, he submitted to the probation of five years' silence. During this time, which he passed partly in Pamphylia and partly in Cilicia, he was able to calm factions about games by mere signs. This, says Philostratus, was not so difficult; for people who quarrel about dancers and horses are easily made ashamed of themselves. It was less easy to quell a tumult caused by a famine. This Apollonius did at Aspendus in Pamphylia, where the people were going to burn the prefect, though he had taken refuge by a statue of the Emperor. And at that time, which was in the reign of Tiberius, the Emperor's statues were more terrible and more inviolable than those of the Olympian Zeus. The prefect, on being questioned by signs, protested his innocence, and accused certain powerful citizens, who were refusing to sell corn and keeping it back to export at a profit. To them Apollonius addressed a note threatening expulsion from Earth, who is the mother of all, for she is just, but whom they, being unjust, have made the mother of themselves alone. In fear of this threat they yielded and filled the market-place with corn.

Having completed his probation, Apollonius visited the great

[1] i. 12 (1): "*ξύστησόν με*" *ἔφη* "*τῷ θεῷ.*" *ὁ δ' ὑπολαβὼν* "*καὶ τί σοι δεῖ τοῦ ξυστήσοντος*"; *εἶπεν* "*εἰ χρηστὸς εἶ; τοὺς γὰρ σπουδαίους οἱ θεοὶ καὶ ἄνευ τῶν προξενούντων ἀσπάζονται.*"

Antioch. He found the people there not only wanting in mental culture, but luxurious and effeminate; and, to judge from the report of Philostratus, seems to have liked that "cradle of the Church" no better than Julian did afterwards. Philostratus here excuses himself for relating myths connected with the temple of Apollo Daphnæus. His purpose, he remarks, is not to mythologise,[1] but to explain how Apollonius came to utter the wish that the god would turn the "semi-barbarous and uncultivated" inhabitants, with their want of all seriousness, into trees, so that thus they might give forth some sound worth listening to. Visiting the temples, he sought to bring back the Hellenic rites to their primitive form: when the rites were alien, he tried to discover their original meaning and to get them corrected in accordance with it. His mode of exposition was not disputatious but magisterial, and this at least gave him some influence with the men of Antioch.[2]

From Antioch he set out with two attendants to visit the Brahmans of India, and, in the course of his journey, the Magi of Babylon and Susa. At Nineveh, Damis, a native of the place, asks and obtains leave to become his companion. Among the Arabians, Apollonius acquires the knowledge they have of the speech of animals. Proceeding on his journey, he encounters a satrap of King Vardanes, the "Mede," who has lately recovered the empire, and whose officials are known as the King's "Eyes" and "Ears." Still, as in the days of Aristophanes, these Oriental titles seem adapted to produce an effect of the grotesque and to form part of the traditional picture of Western Asiatic despotism. We need not try to refer the whole account to the age of Apollonius, though chronologically the Parthian king Bardanes corresponds to the approximate date. The general representation is sufficiently conformable to the revival of the Persian monarchy under the Sassanidæ in the time of Philostratus himself, decked out with circumstances from the historical records of the ancient empire. The narrative is obviously written with a view to contrasting the sim-

[1] i. 16 (2): *οὐχ ὑπὲρ μυθολογίας ταῦτα.*

[2] i. 17 (2): *καὶ ἐπέστρεφεν ἐς ἑαυτὸν ἀνθρώπους ἀμουσοτάτους.*

plicity and independence of the philosopher with the combination of despotism, luxury, and elaborate mechanical art that had distinguished the old civilisations of those regions. Nor is the conception, taken broadly, untrue. The difference of attitude here and in the description of the Indian journey which follows is notable. The Greeks by the time of Philostratus had accumulated some knowledge of India; and, vague as this must have been, it is evident that they had already detected the profoundly philosophical character of the Indian intellect. Thus we are told nothing of what Apollonius was able to learn from the Magi;[1] whereas in the account of his stay in India there is abundance of philosophical interchange of thought. A relatively high but unspeculative religion such as Zoroastrianism or Judaism seems never to have appealed to the Greek mind as did even merely general reports on the tenets of the Brahmans and afterwards of the Buddhists.

Among the decorations of the royal palace at Babylon, we are told, figures of Greek legend were to be seen, Orpheus appearing frequently. Perhaps it is his tiara and his Oriental dress that they are pleased with there: it is not the charm of his music and song. The capture of Athens was represented, and the Persian victory at Thermopylæ, "and things still more Medic, rivers diverted from their course, and the bridging of the sea, and how Athos was cut through."[2] Apollonius refuses to do obeisance to the golden image of the King. The King, who knows him already by repute, is pleased to hear of his coming and sends for him. Being about to sacrifice a white horse to the Sun, he asks Apollonius to accompany him, but the Pythagorean philosopher replies: "You, O King, sacrifice in your own manner, and give me leave to sacrifice in mine." Then, having thrown frankincense on the flame, and uttered a prayer to the god, he departs, so as to have no share in an offering of blood.[3] When the King invites him to join in hunting the animals which the barbarians preserve in their parks or "paradises," he reminds him that he could not even be

[1] Questioned by Damis (i. 26), he says that they are *σοφοὶ μέν, ἀλλ' οὐ πάντα.*

[2] i. 25.

[3] i. 31.

present at his sacrifices, and expresses disapproval of the pleasure taken in the hunting of wild animals kept for sport.[1] In accordance with the general spirit of the picture, he is represented as neither dazzled by the regal magnificence nor impressed by material marvels such as the tunnel under the Euphrates and the walls of Ecbatana. The King, when he takes leave, provides him with the means of continuing his journey to India; and Apollonius describes him to his companions as an excellent man and worthy of a better fate than to rule over barbarians.

Damis says that in crossing the Indian Caucasus he saw the fetters of Prometheus hanging from the rocks, though it was not easy to tell of what material they were composed. Apollonius frightened off a hobgoblin appearing by moonlight. Then, after these and other strange stories, there follows a remarkable disquisition on the inwardness of the divine.[2] Apollonius questions Damis about the effect on his mind of ascending so high a mountain-range. Damis thinks that he ought to be wiser, passing over such a lofty and trackless spot: "For," said he, looking up at the summit, "you hear from our guide that the barbarians make it to be the house of the gods." Moreover, sages like Anaxagoras and Thales are said to have contemplated the heavens from just such elevations. "Yet," he confesses, "I, having ascended the loftiest height of all, shall go down no wiser than I was before." "Nor did they," replies Apollonius, "merely by such prospects, which display only bluer skies and larger stars and the sun rising from the night—sights visible also to shepherds and goatherds: but how the divinity cares for the human race, and how it delights in being served by it, and what is virtue and what justice and temperance, neither will Athos show those that climb it nor Olympus admired of the poets, unless the soul see through them, which, if it take hold of them pure and undefiled, darts farther than this Caucasus."

Indian nomads having furnished the wayfarers with palm-wine and honey, Damis thinks Apollonius can have no objection to tast-

[1] i. 38: *καὶ ἄλλως οὐχ ἡδὺ θηρίοις βεβασανισμένοις καὶ παρὰ τὴν φύσιν τὴν ἑαυτῶν δεδουλωμένοις ἐπιτίθεσθαι.*

[2] ii. 5.

ing this wine, as it is not made from the grape. Apollonius proves to him that it is really wine, just as coins of bronze are no less money than coins of silver or gold. Moreover Bacchus, whose mountain of Nysa is close at hand, will not be angry with him for not drinking wine at all; but, if he refuses that which comes from the vine and yet drinks that which is made from dates, the god will be angry and think his gift disdained. And other wine, as well as that from grapes, intoxicates, as may be seen in the case of the Indians who drink it. This, however, has been said only to excuse himself, since he is bound by a vow. To his companions he does not wish to forbid wine, nor even flesh.[1]

They meet a boy riding on an elephant, and Damis wonders at his skill in managing such a huge beast. Apollonius by questioning brings out that the credit is due not so much to the boy's skill as to the self-restraint of the animal. Philostratus goes on himself to discuss the various accounts of the elephant, one of them by the Libyan King Juba. The general conclusion is that elephants are second only to man in practical sagacity.

King Vardanes has sent a letter to the satrap placed over the Indus, requesting him to conduct Apollonius on his way. He supplies him with the means of navigating the river, and gives him a letter to his own king. Here Philostratus takes occasion to compare the Indus with the Nile, expressing scepticism in both cases as to the snow which is said to lie upon the mountains and to augment the stream by melting.[2] At Taxila was the king's palace. The dress of the Indians is of linen and of "byssus," which comes from a plant.

Visiting the temple before the city-walls, the travellers find representations with metallic materials on brazen tablets. These were comparable for expression to the works of the best Greek painters.[3] The defeat of Porus and the clemency of Alexander were among the subjects represented. In a dialogue on painting and imitative art generally,[4] Apollonius draws the attention of Damis to the shapes seen in the clouds, which appear to us like

[1] ii. 7. [2] ii. 18 (2). [3] ii. 20 (2). [4] ii. 22.

centaurs and other forms of living things, known and unknown. He educes the conclusion that, while such shapes are casual so far as external nature is concerned, there is yet an imitative faculty manifested in our seeing them. This faculty is in us. For man is naturally imitative, even when he has not acquired the power of drawing with the hand; and it is this natural imitative faculty, spontaneously exercising itself, that makes us see such shapes. Nor can the faculty be absent in those who merely view pictures, at least if they are to take pleasure in them. To make possible the pleasure in artistic representations, there must be an active power of supplying something from ourselves. This is shown in the case of paintings in black and white. Draw correctly the features of an Indian in white, and he will appear to the fancy as dark; the color being filled in from past experience. So likewise in viewing the picture by Timomachus of the madness of Ajax: he who is to regard it with admiration must bring to it some image of Ajax and some notion of the whole sequence of events of which his madness formed part. The figures on brass seen in the temple are to be classed, Apollonius proceeds, not under the head of mere metal-working (χαλκευτική), but as products of some art intermediate between that and painting in the special sense. It is an art, he concludes, most like that of Hephæstus in Homer's description of the shield of Achilles.

The king, whose name is Phraotes, invites Apollonius to stay for three days. Describing the construction of the city as viewed by the company, and in particular the temple of the Sun, Philostratus takes occasion to note the "symbolical manner" in which the statue of the god was fashioned,—a manner, he remarks, common to the sacred art of all the barbarians.[1] The Greek sage admired the modesty in the ordering of the palace as compared with the luxury of Babylon. In conversing with the king, Apollonius finds him to be a true philosopher. Phraotes, having dismissed the interpreter, requests Apollonius in Greek to let him join him at a banquet. On being asked why he puts his invitation in this form,

[1] ii. 24.

he replies that it is because he regards wisdom as more kingly than his own rank.[1] At the banquet Apollonius asks him how he acquired Greek and came to be possessed of philosophy. The king smiling returns: "As the people of old times inquired of those who came to their coasts whether they were robbers, because that mode of life, though hard, was common, so you Greeks seem to inquire of all who come in contact with you whether they are philosophers; so much do you think philosophy, though the divinest thing that can fall to the lot of men, to be the affair of every one. And indeed I hear that most of those who profess philosophy among you are in fact robbers; the reason being that, while you have laws to punish coiners of false money and such people, you have no law for trying those who claim to be philosophers and for excluding pretenders."[2]

He then proceeds to explain that in India there are few professional philosophers, and that these are carefully tested before they are allowed to enter upon the philosophic life. First their ancestors for three generations back must have done nothing disgraceful; this being ascertained from public records. In the next place the candidates, on offering themselves at the age of eighteen, are examined in respect both of their moral and intellectual fitness. The examiners[3] make use especially of the indications of physiognomy. For where philosophy is held in high honor, as in India, it is most necessary that those who profess it should be subjected to every kind of test. Next Phraotes relates how he himself came to receive a philosophical education. His grandfather was king before him; but his father, having been dispossessed during his minority, was sent for refuge to a foreign king. This king, who had a better realm than his own hereditary one, would have adopted him; but he preferred, as he said, not to contend with fortune, and obtained leave to devote himself to philosophy, so that he might bear his ills more easily. He afterwards married the king's daughter, and brought up his son Phraotes to

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[1] ii. 27 (1): *τὸ γὰρ βασιλικώτερον σοφία ἔχει.*

[2] ii. 29.

[3] Described (ii. 30) as *σοφοί τε καὶ φυσικοὶ ἄνδρες.*

follow the philosophic life. To this end, he taught him Greek. The sages in consequence readily received him as a pupil at twelve, though this was earlier than the usual age; for they regard a knowledge of Greek as a preparation for training in philosophy.[1] Lastly, Phraotes relates how he came to be restored to his kingdom. Apollonius then asks him if the sages he has spoken of did not become subject to Alexander and appear before him to expound their physical philosophy. The King replies that Alexander indeed came in contact with some who profess wisdom of a kind, but who are really a race of warriors. The genuine philosophers of India are those who dwell between the Hyphasis and the Ganges, and to their country his expedition did not extend. Had he gone on, he could never have taken their tower, which, without preparation, they are able to defend by superhuman means.[2]

The next day at dawn the King comes to the chamber of Apollonius and rallies him on his water-drinking. Those who do not drink wine, he says, do not sleep well. Apollonius replying that they sleep more quietly than those who go to bed drunk, the King protests against the sophistry, and explains that his meaning was that those who drink wine in moderation sleep better than those who drink none at all. This leads to an argument in form. Apollonius contends that even moderate wine-drinkers, while not excited to hallucination, are yet liable to be affected by pleasing illusions, and that these too are troubling to the soul and sometimes prevent sleep. They that drink no wine at all remain always equable, neither elated by good fortune nor dejected by bad. Moreover, it is only to the soul untroubled with wine that true divinations come in dreams. Phraotes, having heard the argument, asks Apollonius if he will make him one of his company; but he puts the question by with the remark that it is good for kings to be conversant moderately with philosophy, but that a too exact and overstrained devotion to it would seem unbecoming and pedantic in their station.[3]

At the end of the visit, Phraotes sends Apollonius and his

[1] ii. 31. Here and later the question occurs, Is it possible that anything was known or conjectured as to the affinity between Greek and Sanskrit?

[2] ii. 33.

[3] ii. 37.

companions on their journey with new provisions and a letter to Iarchas, "the eldest of the sages." They arrive at the plain in which Porus is said to have fought with Alexander. Beyond the Hyphasis they come upon thirty altars inscribed by the Macedonian conqueror to his father Ammon, his brother Hercules, and the other gods. There is also a stele, they record, marking the place where the expedition stopped. This, Philostratus conjectures, was erected not by Alexander himself but by those beyond the Hyphasis, pluming themselves on his not having been able to go further.

The journey to the remoter regions is accompanied by more and more marvels, zoological and other, which however are related not without occasional touches of scepticism. At last we reach the Tower of the Sages; whom the Indians fear more than the King, because the King himself has to consult them about everything that is to be said or done.[1] A young man sent to meet Apollonius addresses him in Greek; at which the travellers are not surprised, since all in the neighboring village speak Greek. He brings a message from the sages inviting—or rather commanding[2]—him to come. In the form of expression Apollonius recognises something Pythagorean.

Traces were still apparent of the rout of Bacchus, who with Hercules had once made an unsuccessful assault on the tower. The images of the gods were like the most ancient of those among the Greeks, and the rites observed were Hellenic. Apollonius himself, says Philostratus, has described the Brahmans. "They dwell upon the earth and not on it, and are fortified without walls, and possess nothing save the possessions of all men."[3] Out of this the biographer, on the authority of Damis, constructs an account of the Brahmans according to which they raise themselves in the air when they choose—not for the sake of vainglory, but to be nearer the Sun-god, to whom they pray—and are furnished with everything as a spontaneous gift of the earth. Perhaps the con-

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[1] iii. 10 (2). [2] iii. 12: *κελεύουσι γὰρ αὐτοί.*

[3] iii. 15 (1): *εἶδον Ἰνδοὺς Βραχμᾶνας οἰκοῦντας ἐπὶ τῆς γῆς κοὐκ ἐπ' αὐτῆς, καὶ ἀτειχίστως τετειχισμένους, καὶ οὐδὲν κεκτημένους ἢ τὰ πάντων.*

jecture is permissible that we have here some real saying of Apollonius misapprehended by a disciple.

Iarchas addresses Apollonius in Greek, and gives proof that he has the minutest knowledge of his whole history. Going in choral procession to the temple, the Brahmans chanted an ode like the pæan of Sophocles which is sung at Athens to Asclepius. After the service of the gods, in which Apollonius had taken part, he asks Iarchas if the Brahmans, knowing all things else, "know themselves." Iarchas instantly replies that it is in consequence of knowing first themselves that they know all things. "What then," asks Apollonius, "do you think yourselves to be?" "Gods," he answered; and, being asked why, "Because," he said, "we are good men." In answer to the question, what they think about the soul, he replied, "We hold the doctrine that Pythagoras handed down to you, and we to the Egyptians." Apollonius then asks whether, as Pythagoras declared himself to have been Euphorbus, Iarchas too can say that before he came into this body he was one of the Trojans or Achæans or some one else. Iarchas thereupon makes the observation that the Greeks are too much pre-occupied with the Trojan war and its heroes, and neglect the greater number of more divine men whom their own land and the land of the Egyptians and that of the Indians bore. Then he says that he too will declare who he was. He proceeds to relate the history of an ancient Indian king named Ganges, who was the son of the River-god. In that he founded cities instead of destroying them, and drove back an invasion of the Scythians from beyond Caucasus instead of bringing the yoke of slavery upon another city,[1] this king was superior to Achilles. More of his deeds would Iarchas record if he did not shrink from praising himself. For he, at the age of four, revealed his identity by discovering seven swords embedded in the earth by King Ganges, and now sought for to fulfil a command of the gods. He then asks Apollonius if he also knows who he was formerly. Apollonius replies that he does, but that his position was an inglorious one. He was the steersman of an Egyptian ship.

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[1] iii. 20 (3): *καὶ ταῦθ' ὑπὲρ γυναικός, ἣν εἰκὸς μηδ' ἀκουσαν ἀνηρπάσθαι.*

In that capacity, however, he once performed a just deed in refusing to betray his ship to Phœnician pirates. This leads to a question about the use of the word "justice," afterwards more fully discussed when Apollonius visits Egypt. Iarchas raises the problem by his criticism that the Greeks seem to think the absence of injustice equivalent to justice, whereas a positive conception is needed.[1]

During the visit of Apollonius to the dwelling of the sages, the King entered. He was not a philosopher like Phraotes, but came arrayed more in the fashion of the Medes, and full of pomp. While the sages themselves ate sparingly, abundance was provided for the King; though it is not lawful for him to partake of the flesh of animals in their presence. He approaches with profound respect the sages who keep their seats. For the repast, self-moving tripods come in, and there are automata to serve as cup-bearers. Apollonius asks Iarchas why he sees precisely eighteen Brahmans present, since eighteen is neither a "square number" nor any other of those that are in repute. Iarchas replies: "Neither are we slaves to number nor number to us."[2] Sometimes they are more, and sometimes fewer, according as there are more or fewer of sufficient wisdom and virtue to be chosen. Then he goes on to blame the Greek democratic mode of appointing to offices by lot, and the fixing of ruling bodies in the Greek cities at a particular number. The king interrupts the conversation by asking questions about the Greeks, of whom, however, he has a mean opinion; imagining, for example, that the Athenians had been enslaved by Xerxes. Apollonius corrects this impression. Xerxes, he maintains, was unfortunate in not having died as well as been defeated at the hands of the Greeks, who in that case would have instituted games in his honor, thinking as they do that it is a praise to themselves to praise those whom they have vanquished. The King explains that he had got his false opinion from the Egyptians, who abuse the Greeks as borrowers of everything from themselves, and as a race of law-

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[1] iii. 25.

[2] iii. 30 (2) *οὔθ' ἡμεῖς ἀριθμῷ δουλεύομεν οὔτ' ἀριθμὸς ἡμῖν.*

less cheats. He invites Apollonius to be his guest, but the invitation is declined.

Iarchas and his associates, questioned by Apollonius as to their views on the constitution of the world, reply that they hold it to consist of elements (ἐκ στοιχείων). These are the four elements of water and air and earth and fire, together with ether as the fifth. No element came into being before the others, but all exist together as parts of the living whole. This is at once male and female, and is held in unison by love of itself. The parts of the world are governed by the mind that is in it. As bearing an analogy to this government of the fabric by mind, Iarchas describes a merchant ship such as the Egyptians send to India. In the vessel of the world, the first place is to be assigned to God the begetter of this animated universe (θεῷ γενέτορι τοῦδε τοῦ ζῴου); the next to the gods who preside over the parts. Of such deities, following the poets, we may admit many, of sky and sea and springs and earth and under the earth. The place beneath the earth, however, since they sing of it as an abode of horror and destruction, does not, if it exists, belong properly to the world.[1]

As an illustration of the powers of the sages, some extraordinary cures are related. A woman comes and explains how her son is possessed by a dissembling and lying demon. One of the Brahmans gives her a formula of exorcism addressed to the demon.[2] A cripple, and a blind man, and a man with his hand paralysed are healed, and recipes are given to effect other cures.

According to his report, Damis was himself present at the dialectical discussions. The study of astrology and divination and sacrifices was pursued only by Apollonius with Iarchas. Philostratus mentions works of Apollonius on these subjects; but remarks that in his own opinion astrological prediction, with all such divination, is beyond the scope of human nature: whether any one has attained to it he does not profess to know. The work of Apollonius on Sacrifices is in so many hands, and is so well and characteristically composed, that exposition of it is unnecessary.[3]

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[1] iii. 34, 35. [2] iii. 38. [3] iii. 41 (2).

Since Damis has given an account of a conversation on the strange animals and so forth of India, Philostratus, while declining to commit himself to the truth of the stories, will not wholly pass the subject by.[1] For the rest, the account of the Indian journey ends, as it begins, with enough of the marvellous. Philostratus was on the whole content to put into literary form the travellers' tales he knew; hinting sometimes to the less credulous his uncertainty as to what grains of truth might be found in the more extraordinary of them.

After a stay of four months, Apollonius leaves the Brahmans. A letter is given as from him in which he is made to say that he has received from them the power of going through the sky (*διὰ τοῦ οὐρανοῦ πορεύεσθαι*) and of conversing with them at a distance as if they were present.[2] He and his companions return to the region of the Indus, then put to sea, and sail up the Euphrates to Babylon. Returning to the Roman Empire, they go to Antioch; but, finding it as insolently indifferent as ever to Hellenic culture,[3] they put to sea again at Seleucia, and sail thence to Cyprus. From Cyprus they proceed to Ionia, where Apollonius is held in much honor.

When he came to Ephesus, we are told,[4] even the artisans left their work to follow him. He delivered a discourse to the Ephesians in favor of a voluntary community of goods; teaching by the example of a sparrow that came to call the others to join him in feasting on the corn spilt by a boy carrying a basket. He foresaw a threatening pestilence, but, as they did not heed his warnings, he went to the other parts of Ionia; continuing everywhere his reforming activity and his salutary discourses.[5]

A discourse at Smyrna is given[6] in which he exhorts the Smyrnæans to make themselves an object of pride even more than the

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[1] iii. 45 (1): *καὶ γὰρ κέρδος εἴη μήτε πιστεύειν μήτ' ἀπιστεῖν πᾶσιν.*

[2] iii. 51.

[3] iii. 58: *τῆς 'Αντιοχείας ξυνήθως ὑβριζούσης καὶ μηδὲν τῶν 'Ελληνικῶν ἐσπουδακυίας.*

[4] iv. 1.

[5] iv. 4: *διορθούμενος τὰ παρ' ἑκάστοις καὶ διαλεγόμενος ἀεί τι σωτήριον τοῖς παροῦσιν.*

[6] iv. 7.

beauty of their city. For although it is the fairest of all cities that are under the sun, and possesses the sea, and has the springs of the west wind, yet it is better for it to be crowned with men than with porticoes and paintings and greater abundance of gold. Buildings are seen only in that part of the earth where they are; but good men are seen everywhere and spoken of everywhere, and render the city they have sprung from as wide as the extent of land they penetrate. Cities that are fair externally are indeed like the Phidian image of Zeus at Olympia: but those that have men that reach every part of the world are like the Homeric Zeus, who is suggested to thought in various forms, and as moving through the heaven, and so is a more wonderful piece of work than the seated statue of ivory visible to the eye. Discussing politics with the Smyrnæans, he told them that a rightly ordered city has need of concord in variance.[1] That is to say, each must make it his ambition to be better than the rest in something. The ancient Spartans were wrong in their exclusive devotion to military affairs. Each ought to do what he knows best and can do best. If one gains distinction by becoming a popular leader, another by wisdom, another by amassing wealth for the common good, and so forth, then the whole city will stand firm. This he illustrates by the example of a ship with its division of employment.

The plague having actually fallen upon Ephesus, the Ephesians sent an embassy to Apollonius. He was there on the instant —as Pythagoras was at Thurium and Metapontum at the same time—and stayed the plague by destroying a demon in the guise of an old beggar-man, revealed afterwards as a monstrous beast.[2] He decided on a voyage to Greece, but first visited the tomb of Achilles in the Troad. When they were afterwards sailing the Euboic Sea, Damis questioned him about his visit, and Apollonius recounted his conversation with the shade of the hero, which disappeared with a glimmer at cockcrow.[3] Arriving at the Piræus at the time of the Eleusinian mysteries, he was joined on his way to

[1] iv. 8 (1): *ὁμονοίας στασιαζούσης.* [2] iv. 10.

[3] iv. 16 (6): *ἀπῆλθε ξὺν ἀστραπῇ μετρίᾳ· καὶ γὰρ δὴ καὶ ἀλεκτρυόνες ἤδη ᾠδῆς ἤπ-οντο.*

Athens by ten young men who were about to set sail to Ionia to see him. He offers himself for initiation in the mysteries; but the hierophant raises objection to him as an enchanter and as "not pure in respect of divine things." Made aware of the popular disapproval, he changes his tone; but Apollonius now declines initiation till another time; mentioning the name of the successor to the office, who, as he foresees, will initiate him. At Athens, in deference to the devotional spirit of the place, he first discoursed about sacrifices, thus refuting the calumnious and ignorant assertion of the hierophant.[1] A youth who interrupts a discourse of his with inane laughter he finds to be under demoniacal possession. The demon, being commanded to go out of him and to give a sign of his departure, says that he will throw down a statue on his way. This he does to the astonishment of the audience. The youth afterwards followed the philosophic mode of life.[2] Hearing of the frivolities with which the Athenians were now accustomed to celebrate the Dionysia, Apollonius rebuked them by reminding them of the exploits of their ancestors and of their legendary connection with Boreas, the most masculine of the winds. Another abuse which he arrested at Athens was the introduction of gladiatorial exhibitions,—which were going on, Philostratus tells us, at Corinth in his own day.

In a journey to Thessaly, Apollonius visited the tomb of Leonidas, which he all but embraced.[3] When his companions were disputing which was the highest mountain in Greece, he ascended the height where the Spartans had been overwhelmed by the Persian arrows, and said that those who died there for liberty had equalled it to Œta and raised it above many an Olympus. In the account of his residence at Corinth we come upon the original of the story of Keats's *Lamia*.[4] This occurrence, says Philostratus, was already well known, but only in general outline, and as having taken place in central Greece. He has given the details for the first time from the record of Damis. At Olympia, receiving an in-

[1] iv. 19: *τίς γὰρ ἐτ' ὠφθη τὰ δαιμόμια μὴ καθαρὸν εἶναι τὸν φιλοσοφοῦντα, ὅπως οἱ θεοὶ θεραπευτέοι;*

[2] iv. 20. [3] iv. 23: *μονονοὺ περιέβαλεν.* [4] iv. 25.

vitation to Sparta from a Lacedæmonian embassy which he observed to be full of luxury, Apollonius wrote to the ephors on the subject and brought about a restoration of the ancient manners. A conceited youth submitted to him a long panegyric on Zeus. The philosopher asked him if he had ever written in praise of his own father. He replied that he should have liked to do so, but found that he could not do it adequately. "Then," replied Apollonius, irritated as he was apt to be by vulgar pretence,[1] "If you do not think you can fitly praise your father whom you know, do you not see that, in undertaking to praise the father of gods and men and the fashioner of all that is around us and above us, you have entered upon a task beyond human powers?"

One incident of his visit to Sparta may be quoted for the light it throws on his general attitude as a reformer. A young man who was a descendant of Callicratidas, the Spartan admiral at Arginusæ, had an action brought against him because he had adopted a sea-faring life for gain, and because he took no part in public affairs. Apollonius succeeded in convincing him that in this he was derogating both from his ancestral traditions and from those of Sparta. He accordingly gave up his mercantile pursuits, and at the intercession of Apollonius was acquitted by the ephors. Superficially this may seem inconsistent with the discourse at Smyrna, but in reality it is part of the same general ideal. In that ideal, local diversity is included. Thus at Athens, as we shall afterwards find, Apollonius will allow no disrespect towards the sea-faring tradition; whereas here he reminds the descendant of Callicratidas that the Spartans lost their military power when they took to the sea.[2]

The humanitarian tendency which the reforming movement combined with its regard for antique ideals becomes evident when we are told expressly that Apollonius treated the slaves of his companions as a part of his philosophic community.[3] Passing over

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[1] iv. 30 (3): *δυσχεράνας οὖν ὁ Ἀπολλώνιος (τοντὶ δὲ πρὸς τοὺς φορτικοὺς τῶν ἀνθρώπων ἐπασχεν).*

[2] iv. 32. Cf. v. 20.

[3] iv. 34 (2): *κοινὸν δ' ἐκάλει τοὺς θ' ἑταίρους καὶ τοὺς τῶν ἑταίρων δούλους· οὐδὲ γὰρ ἐκείνους παρεώρα.*

some intermediate incidents, we may follow him westward to Rome, where at this time Nero was persecuting philosophy.

The philosophic cloak, says Philostratus, was proceeded against in the law-courts as a disguise of diviners. Not to mention other cases, Musonius, a man second only to Apollonius, was imprisoned on account of his philosophy and came near losing his life. Before Apollonius and his company reach the gates, a certain Philolaus of Citium tries to deter them from proceeding. To Apollonius this seems a divinely-ordained test to separate the stronger disciples from the weaker (whom, however, he does not blame); and, in fact, out of thirty-four, only eight remain with him, the rest making various excuses for their flight at once from Nero and from philosophy. Of those who remained was the young man whom he had rescued from the transformed serpent.

He stigmatises the reigning tyranny as one so grievous that under it men are not permitted to be wise.[1] His discourses being all public, no accusations were made against him for a time. He did not seek out men of position, but welcomed them if they came, and discoursed to them exactly as to the common people.[2] At Corinth a Cynic philosopher named Demetrius had attached himself to him as Antisthenes did to Socrates. This man now came to Rome and brought suspicion on him of responsibility for the violent attacks he himself proceeded to make on Nero. A public protest against luxury delivered on a feast-day in a gymnasium which the Emperor was opening in person led to his expulsion from Rome by Nero's minister Tigellinus, who henceforth kept a close watch on Apollonius. His opportunity came at last when there was an epidemic of colds and the temples were full of people making supplication for the Emperor because he had a sore throat and the "divine voice" was hoarse. Apollonius, bursting with indignation though he was at the folly of the multitude, did not chide any one, but tried to calm a disciple by telling him to "pardon the gods, if they delight in buffoons." This saying being reported to Tigellinus, he had him arrested under the *lex majestatis*. On

[1] iv. 38 (2): *τυραννίδος....καθεστηκυίας οὕτω χαλεπῆς, ὡς μὴ ἐξεῖναι σοφοῖς εἶναι.*
[2] iv. 41.

bringing him to trial, however, he found himself baffled, and, in fear of his superhuman powers, let him go.[1]

An incident at Rome is recorded that was thought to be an illustration of those powers. A maiden who was about to be married had died or appeared to have died, and was being carried to the grave amid the lamentations of all Rome; for she was of a consular family. Apollonius, meeting the funeral procession, commanded them to set down the bier, and, saying something inaudible, restored the maiden to life; who then, like Alcestis brought back by Hercules, returned to her father's house. Whether he detected a spark of vitality that had escaped the notice of the physicians, or renewed the life that was extinct, Philostratus acknowledges to be beyond his own judgment, as it was beyond the judgment of those who were present.[2]

The next voyage of Apollonius was to the region of the Baetis in Spain. Philostratus here tells some anecdotes to illustrate the greater or less civilisation of the surrounding country. When a courier came to Gades to announce the triple victory of Nero at Olympia, the people there understood what was meant; but those of the neighboring cities, who knew nothing about the Greek games, got the notion that the Emperor had been victorious in war and had taken captive certain "Olympians."[3] A tragic actor came to Hispalis. Where the people retained less of the antique barbarism in their manners, they were pleased with tragedy as a new thing; but here the mask, and the lofty elevation of the actor, and the portentous robes, and the resonant voice, terrified them till they fled as from a demon.[4] Apollonius was sought out by the prefect of the province. The subject of their conversations is unknown; but Damis conjectures that they plotted against Nero; for, when the prefect took his leave, the last words of Apollonius were, "Farewell, and remember Vindex." Philostratus reminds the reader that it was Vindex who first stirred up the peoples of the West against the Emperor when he was making his progress

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[1] iv. 44 (4): "*χώρει,*" *ἐφη* "*οἱ βούλει· σὺ γὰρ κρειττων ἢ ὑπ' ἐμοῦ ἀρχεσθαι.*"

[2] iv. 45. [3] v. 8. [4] v. 9.

through Achaia; and mentions that he addressed to his soldiers an oration such as one inspired by the noblest philosophy might breathe forth against a tyrant.[1]

Apollonius and his companions proceed by way of Africa to Sicily. Hearing of the flight of Nero and the death of Vindex, Apollonius in an oracular utterance predicts the brevity of the reigns of the next three emperors (Galba, Otho, and Vitellius). Such predictions Apollonius made, his biographer insists, not as an enchanter, but so moved by a divine impulsion as to know what the fates had in store. Enchanters or magicians (*οἱ γόητες*), "whom," says Philostratus, "I regard as the most wretched of men," proclaim that by juggling artifice and by barbarian sacrifices they can change the purpose of the fates; and many of them, when judicially accused, have confessed that this is the nature of their wisdom. Apollonius, on the other hand, followed the decrees of the fates, and foretold what would come to pass of necessity. So far was he from all juggling that when he saw the automata in India he praised the ingenuity of the contrivances but did not care to learn the details of their mechanism.[2]

At Catana, the story is told that Typho is bound there, and that from him arises the fire of Ætna. Apollonius takes this occasion to lead his disciples to a more "physical" view of volcanic eruptions. He begins with a paradox on the fables of Æsop; that they are to be preferred to those of the poets, in respect of wisdom, precisely because they are not told with such coloring as to give the impression that they are literally true. The didactic purpose in them is thus made obvious; whereas the poets leave it to the intelligence of their readers to discover the truth. He himself relates a story about Æsop and Hermes, told to him as a child by his mother; the point of the story being that the god had suggested to Æsop a line of invention that was at least his own, if it was humble. As for the myth about the contention of giants with gods for the possession of heaven, this is madness to say or to think.[3]

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[1] v. 10 (2): *λόγον....ὃν ἐκ πάνυ γενναίας φιλοσοφίας ἐπὶ τύραννον ἂν τις πνεύσειεν.*

[2] v. 12.

[3] v. 16.

The cause of these outbursts of flame from volcanoes is in reality a mixture of bitumen and sulphur blown upon by subterranean winds in the crevices of the earth.

Revisiting Athens, Apollonius is initiated into the mysteries, as he had foreseen. The winter he spends in visiting the Greek temples. He projects a voyage to Egypt in the spring, and, going down to the Piræus, finds a ship. The owner refuses to let him go on board, because, as he is conveying a cargo of images of the gods, he is afraid to admit sea-faring company, which is usually bad. Apollonius reminds him—since he appears to be an Athenian —that the gods themselves when they went on board the ships and took part with Athens against the barbarians, had no fear of contamination from disorderly sailors. He also censures the traffic in images.[1]

At Rhodes he tells a newly-rich and uneducated youth who is building a fine house and collecting paintings and statues for it that he does not seem to possess the house, but the house to possess him.[2] Coming to Alexandria, he is treated with great reverence. Here an example was seen of his marvellous powers. Twelve men condemned for robbery were being led to execution. He perceived that one of them was innocent, and told the executioners to place this man last; meanwhile prolonging his speech so as to gain time, contrary to his custom of brief utterance. When eight had been decapitated, a horseman rode up with a reprieve for the prisoner on whose behalf Apollonius had interceded; his innocence having since been established.[3]

We are told of a dispute in the temple with an Egyptian priest regarding animal sacrifices, and of a discourse reproving the Alexandrians for the sanguinary quarrels that arose from their devotion to the contests of the hippodrome. At this point of the narrative, Vespasian arrives in Alexandria from Judæa, aiming now at the Empire. The philosophers Dion and Euphrates bid the people rejoice. For, says Philostratus, the last fifty years had been a period of tyrannies so harsh that even the reign of Claudius, though

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[1] v. 20. [2] v. 22 (2). [3] v. 24.

he was better than the emperors before and after, had seemed to give no respite.[1] Apollonius was equally glad, but did not care to obtrude himself. Vespasian, however, sought him out, and first set forth to him alone his reasons for seeking the empire; though he had commended to him his fellow-philosophers also as advisers. Apollonius heartily approves of his purpose; and, to his astonishment, tells him that he is destined to rebuild the temple of Jupiter Capitolinus at Rome. He did not yet know that the temple had been burned down; but it was afterwards found that this was the case, and that the conflagration had been manifested to Apollonius sooner than if it had taken place in Egypt.[2]

The day after the private interview with Apollonius, the other philosophers are called in. Vespasian formally explains to them the motives of his action; describing the tyranny to which the Roman world has been subject from the reign of Tiberius, and pointing out that if Vitellius is allowed to rule, Nero will have come to life again. "You have learned how not to govern," said Apollonius, "from those who governed badly: let us now consider how a good ruler ought to act."[3] Euphrates, however, who has become jealous of the special attention paid to Apollonius, makes a long speech in Stoic phraseology; first remarking that it is premature to consider how one is to proceed in a certain course of action before it has been decided whether that is the right course. In the end he approves of the resolution of Vespasian to march against Vitellius, but advises that, if he is victorious, he should restore to the Romans the democratic form of government under which they were most prosperous, and gain for himself the glory of having begun an era of freedom. Dion partly agrees and partly disagrees with the advice of Euphrates. He agrees in particular that Vespasian would have done better to let the Jews separate if they

[1] v. 27. Tacitus also dated the beginning of improvement from the reign of Vespasian, to whose personal example he ascribes some influence in the return from excessive luxury to a simpler mode of living: "Nisi forte rebus cunctis inest quidam velut orbis, ut quem ad modum temporum vices, ita morum vertantur; nec omnia apud priores meliora, sed nostra quoque aetas multa laudis et artium imitanda posteris tulit." (*Ann.* iii. 55.)

[2] v. 30.

[3] v. 32 (3).

chose; political separation being appropriate to the singularity of their manners. Instead of spending his force in bringing them to subjection, and thus doing all that was in his power to preserve the empire for Nero, he ought to have straightway attacked him. At the same time he approves of the enterprise against Vitellius. A democracy, if inferior to an aristocracy (of Platonic type), is to be preferred to tyrannies and oligarchies; but he fears lest the Roman people, tamed as they now are by a series of tyrannies, should find the transition to liberty as unbearable as that from darkness to sudden light. Let Vespasian, however, put the question to the vote, and if the people choose democracy, grant it. In that case he will win fame universal and unparalleled. If, on the other hand, they choose monarchy, who should be emperor but himself? Apollonius demonstrates at length the impracticability of all this. To him personally the form of political government is indifferent, since he lives under the gods; but he does not think that the human flock ought to be left to perish for want of a just and prudent pastor. As one man pre-eminent in virtue, when he becomes ruler in a democracy, makes that polity seem identical with the form of government in which the one best man rules; so the government of one, when it keeps steadily in view the good of the commonwealth, is in effect a democracy.[1] At Vespasian's request Apollonius, premising that the art of government is not a thing that can be taught, goes on to lay down some general maxims for the exercise of kingly power. The king is himself to be ruled by the law. Vespasian personally is advised not to let his sons take for granted that the empire will fall to them as his heirs, but to teach them to regard it as the prize of virtue. He is not to go too fast in repressing the pleasures to which the people have become accustomed: they must be brought to temperance by degrees. Governors of provinces should know the language of the provinces they are sent to govern. The disadvantage of not observing this rule he illustrates from the failure in the administration of justice when he was in the Peloponnese; the Roman governor, who did not know Greek,

[1] v. 35 (4).

being at the mercy of those who had an interest in deceiving him. Euphrates allows that further discussion would be idle, since the course to be taken has already been resolved on; but, with an allusion glancing at Apollonius, gives the future emperor the parting advice to embrace the philosophy that is according to nature, and to have nothing to do with that which professes itself inspired by the gods, liable as such claims are to be the source of deception.[1] Vespasian perceives his animus: and, when Euphrates afterwards hands him an epistle full of requests of presents for himself and his friends, he reads it aloud; thus giving Apollonius the opportunity of retorting on Euphrates by contrasting his readiness to ask for gifts from the emperor with his counsel to establish a democracy.

This, Philostratus tells us, is what he has been able to learn about the origin of the difference between the two philosophers. With Dion, Apollonius was always on good terms, though he thought Dion's philosophy too rhetorical. Euphrates, according to the story, was afterwards in favor under Domitian. When Vespasian as emperor revoked the liberty granted by Nero to Greece, Apollonius did not care to see him again; though he approved of his good administration generally. In connection with the story of the philosopher at Alexandria, a strange tale is recounted of his detecting the soul of King Amasis in a tame lion.[2] He left Alexandria on a journey to Æthiopia, accompanied by ten disciples out of the number that had again gathered round him since the dispersal under the persecution of Nero.[3]

On the borderland between Egypt and Æthiopia a primitive system of barter was practised. This Apollonius praised for its moral superiority over the habits of commercial bargaining among the Greeks.[4] An Egyptian youth named Timasio, who had overcome a temptation similar to that of Hippolytus, guided the company to the celebrated statue of Memnon. Apollonius praises him for his

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[1] v. 37 (1): *φιλοσοφίαν δέ, ὦ βασιλεῦ, τουτὶ γὰρ λοιπὸν προσειρήσεται, τὴν μὲν κατὰ φύσιν ἐπαίνου καὶ ἀσπάζου, νὴν δὲ θεοκλυτεῖν φάσκουσαν παραιτοῦ· καταψευδόμενοι γὰρ τοῦ θείου πολλὰ καὶ ἀνόητα ἡμᾶς ἐπαίρουσιν.*

[2] v. 41. [3] Cf. iv. 37. [4] vi. 2.

continence, and regards him as of more merit than Hippolytus because, while living chastely, he nevertheless does not speak or think of the divinity of Aphrodite otherwise than with respect.[1] He and his companions, still guided by Timasio, arrive among the Gymnosophists, whom they have set out to visit. In consequence of a trick of Euphrates, who has sent his disciple, Thrasybulus of Naucratis, to prepossess them against Apollonius, they put off receiving him for some time. At length, after negotiations through Damis, who detects the trick, they consent to receive him, though still resenting his reported preference of the Indian wisdom to their own.

The eldest and chief of them, who is called Thespesio, delivers a long address, in which he seeks to place the aims of himself and his associates above those of the Indians; advising Apollonius to have no care about automata or wonder-working, but to choose rather the wisdom that goes with toil and simplicity of life. In his peroration, he reminds him of the pictures he must have seen of the Hercules of Prodicus. As in the Choice of Hercules Vice stands on one side luxuriously adorned, and Virtue poorly clad on the other; so let Apollonius think of himself as placed between the alluring wisdom of the Indians and the rugged discipline of the Egyptian Gymnosophists. Apollonius explains that he has not come thus late to make his choice between two philosophies. Surrounded as he was in his youth by the teaching of all the schools, he of his own accord adopted the Pythagorean discipline, in spite of the austerity which from the first it did not conceal.[2] Among the rewards it promises to its votaries is to appear more pleasing to the gods though sacrificing little than do those who pour forth to them the blood of bulls. The doctrine of Plato regarding the soul, divinely taught by him at Athens, Apollonius perceived not to have won general acceptance among the Athenians. He therefore sought out a city or nation in which one person should not say

[1] vi. 4.

[2] Special stress is laid on the virtue of chastity. The Pythagorean philosophy is represented as addressing the neophyte: *κἂν ἀφροδισίων ἡττηθέντας αἰσθωμαι, βάραθρά ἐστί μοι, καθ' ὧν σοφίας ὀπαδὸς δίκη φέρει τ' αὐτοὺς καὶ ὠθεῖ.* See vi. 11 (5).

one thing and another the opposite, but the same doctrine should be confessed by all. First, accordingly, he looked to the Egyptians; but his teacher told him that the original fathers of this wisdom were the Indians. For the rest, he addresses to the Gymnosophists an apology on behalf of the arts and graces of life and the adornment of temples; pointing out that Apollo does not disdain to clothe his oracles in verse, and that self-moving tripods are introduced by Homer at the banquets of the gods. Nor has any accusation yet been laid in heaven against Hephaestus for corrupting matter by his art. Every art will have a care for ornament; because the very being of arts was invented for the sake of ornament.[1]

The speech of Apollonius made a powerful impression on all, and especially on Nilus, the youngest of the Egyptians. Thespesio, though black, might be seen to blush. This, of course, is a reminiscence of Thrasymachus in the *Republic*, as it is likewise when we are told that he becomes reconciled with Apollonius. Requested by Nilus and Thespesio, Apollonius recounts his adventures. He and his companions are courteously entertained by Nilus at a repast. Nilus desires to become his companion; and, to show that this is no rash impulse on his part, relates his history. His father had sailed to the Indian coast, and had told him what he had heard about the sages in India. Informed by him also that the Gymnosophists were a colony from thence, he gave up his patrimony and joined them. He found them wise indeed, but not like the Indians; and had he not met with Apollonius, he would himself have sailed to India like his father. The eager and ingenuous Nilus also proposes that he shall try to persuade his elders of the inferiority of their wisdom: but this Apollonius discountenances; receiving him on condition that he will not make an attempt which would be of no avail.

Apollonius pays a visit to Thespesio, and asks him to instruct him in the Egyptian wisdom, so that he may communicate it to

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[1] vi. 11 (17): *κόσμου γὰρ ἐπιμελήσεται τέχνη πᾶσα, ὅτι καὶ αὐτὸ τὸ εἶναι τέχνας ὑπὲρ κόσμου εὕρηται.*

others, as he has communicated that which he received from the Indians. Thespesio signifies his readiness to answer questions. Apollonius begins by asking why the Egyptians represent the gods for the most part so absurdly; their sacred images being apparently made in honor of irrational animals rather than of divine beings. Thespesio parries this attack on zoömorphism by a similar question about the anthropomorphism of the Greeks. Did your Phidias and your Praxiteles ascend into heaven and copy the forms of the gods? And if it was not imitation that produced their art, what then could it be? An artist of more wisdom, answers Apollonius, namely, imagination.[1] He who conceives the form of Zeus must see him in his mind's eye accompanied by the heaven and the seasons and the stars: the fashioner of a statue of Athena must think of armies, and of wisdom in counsel, and of the arts, and of how she sprang from the head of Zeus. Thespesio, on his part, contends that the Egyptians display more reverence to the gods in not audaciously trying to realise some conception of their forms, but using only symbol and suggestion. Apollonius replies that there is nothing to call forth reverence in the image of a dog or an ibis or a goat. If, as Thespesio says, that is regarded with more reverence which is only suggested to the mind, then the Egyptians should have had temples and rites indeed, but no images at all; leaving the mental representation entirely to the worshipper. "But you," he says in concluding, "have taken away from the gods both visible beauty and the beauty of suggestion."[2] "There was a certain Athenian named Socrates," is the retort of Thespesio, "an old man of no intelligence like ourselves, who used to swear by the dog and by the goose and by the plane-tree." "Not that he thought them gods," returns Apollonius, "but so that he might not swear by the gods."

Thespesio, as if changing the subject, inquires about the scourging of boys at Sparta. Do the Greeks endure such a custom? And did Apollonius not reform it when he was occupying

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[1] vi. 19 (3): *φαντασία ταῦτ' εἰργάσατο, σοφωτέρα μιμήσεως δημιουργός.*

[2] vi. 19 (5): *ὑμεῖς δ' ἀφῄρησθε τοὺς θεοὺς καὶ τὸ ὁρᾶσθαι καλῶς καὶ τὸ ὑπονοεῖσθαι.*

himself with the affairs of the Lacedæmonians? Apollonius replies that it would have been madness to contend against a religious custom such as this. The scourging is performed in accordance with an oracle directing that the altars shall be sprinkled with an offering of human blood to the Scythian Artemis. This no doubt was originally a requirement of human sacrifice; but the Spartans, by subtly interpreting it, have at once evaded the obligation of putting a human victim to death and turned a rite which they could not get rid of into an exercise in fortitude. Thespesio, however, skilfully presses the point; ending with the remark that he has been speaking not against the Lacedæmonians but against Apollonius. If we thus rigorously investigate customary rites the origin of which reaches back to a grey antiquity beyond knowledge, and cross-examine divinities as to their reasons for delighting in them, not the Eleusinian nor the Samothracian nor any other mysteries will be safe. We can always ask "Why this and not that?" and take offence at one thing or another. In these matters at any rate, if not in all, the Pythagorean silence is good. Apollonius accordingly, relinquishing further argument on behalf of the Spartans, consents to go on to another topic, and proposes that they shall discuss the nature of justice.[1]

Such a subject of discourse, Thespesio agrees, is suitable both for professional philosophers and for others. Apollonius then recalls the comment of the Indian sages on his notion that when, being in a former body, he had refused to betray his ship to pirates, he had performed an act of justice. They laughed at this use of the word, holding that justice involves something more than the absence of injustice. Rightly, answers Thespesio, for no virtue consists in a mere negation. And we must not expect to find men publicly rewarded for practising justice. In the cases of Socrates and of Aristides we rather find the opposite. No doubt it will seem absurd: but as a matter of fact Justice, being appointed by Zeus and the Destinies to prevent men from injuring one another, takes no measures to prevent herself from being injured. Imagine,

[1] vi. 20.

however, that when Aristides returned from his apportionment of tribute among the allies of Athens, the proposal had been made by two orators to confer the crown upon him for his justice; and that one had assigned as the reason his returning no richer than he went, and the other his observance of due proportion to the capacity of each allied State, and his refraining from all excessive demands: would not Aristides himself have protested against the first orator for the inadequacy of his reason, and recognised that the second was aiming at the true mark? And indeed, in maintaining due proportion, he had regard to the advantage both of Athens and of the islands; as was seen afterwards when the Athenians, by imposing heavier burdens, brought about the revolt of their tributaries and the loss of their empire. He, then, is just who both acts justly himself and so orders things that others shall not act unjustly. And from this diffusive virtue—which is better than oaths taken on sacrifices[1]—will spring both other virtues and in particular those of the judge and of the legislator, which come peculiarly within the province of justice.[2]

To this account of the just man Apollonius assents. After some further discourse, he informs Thespesio of his intention to go in quest of the sources of the Nile. In the account of so remote a journey the geography and zoology as usual become mixed with the marvellous, though they are not wholly fictitious. We are told of the Androphagi and the Pygmies, who are of Æthiopian race, and extend as far as to the Æthiopic Sea, into which no one voluntarily sails. We also hear of cataracts haunted by dæmons; and there is a curious story about the taming of a satyr in one of the villages by Apollonius.

On his return, he signified his approval of the conduct of Titus after he had taken Jerusalem, in refusing to accept a crown from neighboring nations.[3] Titus, now associated with his father in the

[1] vi. 21 (7): *δικάσει μὲν γὰρ τοιόσδε πολλῷ δικαιότερον ἢ οἱ κατὰ τῶν τομίων ὀμνύντες.*

[2] It is noteworthy that the place here assigned to justice as a positive virtue coincides with that which it occupies in Dante's description of the spirits in the heaven of Jupiter, who are those of men that bore rule on earth.

[3] vi. 29: *μὴ γὰρ αὐτὸς ταῦτ' εἰργάσθαι, θεῷ δ' ὀργὴν φήναντι ἐπιδεδωκέναι τὰς ἑαυτοῦ χεῖρας.*

government, invited him to Argos, and consulted him as to his future behavior as a ruler. Apollonius says that he will send him his companion Demetrius the Cynic as a free-spoken counsellor; and Titus, though the name of the Cynic is at first disagreeable to him, assents with a good grace.[1] He is also said to have consulted Apollonius in private on his destiny.

Apollonius, says Philostratus at this point, made many more journeys, but only to countries he already knew. He remained always like himself; and this is for the sage even more difficult than to know himself. Before proceeding to the account of his acts and sufferings under Domitian, the biographer brings together a few miscellaneous anecdotes. One of these throws interesting light on popular beliefs in the eastern provinces of the Roman Empire. The cities on the left of the Hellespont, it is recorded,[2] being once troubled with earthquakes, certain Egyptians and Chaldæans were collecting money for a sacrifice, estimated at the price of ten talents, to Earth and Poseidon, and declared that they would not perform the sacrifice till the money was paid down. Apollonius drove them away for their greed, and by due rites quieted the earth.

Since those who adopt the philosophic life are best proved by their attitude to tyrannies, the behavior of Apollonius in face of Domitian has now to be compared with that of elder philosophers when confronted with tyrannies in their time. Philostratus proceeds to make the comparison in set form; maintaining the thesis that Apollonius showed his superiority to all others, high-minded as they had undoubtedly proved themselves. It is not his purpose to depreciate the rest, but it is his duty to show the greatness of his hero.[3]

Some of the sayings of Apollonius against the Emperor having been recorded, we are told that he fell under suspicion through his correspondence with Nerva and his associates Orfitus and Rufus. When proceedings against them were begun, he addressed to the statue of Domitian the words: "Fool, how little you know of the

[1] vi. 31. [2] vi. 41. [3] vii. 1, 2.

Fates and Necessity! He who is destined to reign after you, should you kill him, will come to life again."[1] This was brought to Domitian's ears by means of Euphrates. Foreknowing that the Emperor had decided on his arrest, Apollonius anticipated the summons by setting out with Damis for Italy. They arrive at Puteoli, and there fall in with Demetrius, who leads them to the seat of "the ancient Cicero," where they can converse privately. Demetrius tells Apollonius that he is to be accused of sacrificing a boy to get divinations for the conspirators; and that further charges against him are his dress and his manner of life and the worship that is said to be paid to him by certain people. He then tries to dissuade him from staying to brave the anger of a tyrant who will be unmoved by the most just defence, and who is undistracted by that devotion to the Muses which, when Nero was singing and playing on the lyre, gave the world some respite. Damis, who till now has been unaware of the purpose of his master in coming, seconds the argument of Demetrius. Apollonius holds this timorous counsel excusable on the part of Damis, who is an Assyrian and has lived in the neighborhood of the Medes, where tyrannies are adored; but as for Demetrius, he does not know how he will make his apology to philosophy. He himself intends to remain; and in justification he sets forth the arguments that this is the only course worthy of his character. Of despotisms he allows that that is the most dangerous kind which, like the tyranny of Domitian, proceeds under forms of law. All the more, however, is he bound to appear and answer the charge against him: to flee from a legal trial would have the appearance of self-condemnation. And whither shall he flee? It must be beyond the limits of the Roman Empire. Shall he then seek refuge with men who know him already; to whom he will have to acknowledge that he has left his friends to be destroyed by an accusation which he has not dared to face himself? Perhaps Demetrius will tell him to go among those who do not know him. But here too, as he makes impressively clear, starting from the use of the word by Euripides

[1] vii. 9 (1).

in the *Orestes*, the power called conscience (σύνεσις) will follow him, and will allow him no peace whether awake or asleep.[1] At the end of this address, Damis recovers courage, and Demetrius, far from continuing his opposition, cannot sufficiently express his admiration of Apollonius.

The *præfectus prætorio* at that time, the narrative continues, was Aelianus, who had been acquainted with Apollonius in Egypt. As a diversion in his favor before he arrives, he argues to the Emperor that the "chattering sophists," having nothing to enjoy in life, deliberately try to draw death upon themselves at the hands of those who bear the sword. Perceiving this, Nero could not be brought by Demetrius to give him the death he desired, but let him go, not as pardoning him but out of contempt.[2] On the arrival of Apollonius as a prisoner, Aelian uses his authority to submit him to examination in secret. When they are alone, he gives expression to his friendly feeling, but explains the necessity of proceeding with caution. Apollonius asks him what he is accused of. Aelian repeats the heads of accusation already mentioned; informing him that the most serious charge is precisely that which he himself knows must be false, but which the Emperor is most disposed to believe true: namely, that Apollonius slew an Arcadian boy for sacrifice to encourage Nerva in aspiring to the empire; the offering being made at night by the waning moon.[3] In answering the charge, however, let Apollonius avoid a contemptuous attitude. The interview being at an end, Aelian calls in the guards, and, with simulated anger, consigns him to custody among those who are awaiting their trial.

In prison, he is derided by a military tribune, who tells him that *he* knows what he is accused of if Apollonius does not. He is accused of being worshipped by men and thinking himself worthy

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[1] vii. 14 (8–10). This passage is of high interest philosophically, as showing how fully the ethical conception of conscience had already been brought into view. The psychological conception of consciousness (sometimes expressed by the same word) was not so completely formulated till the Neo-Platonic period, with its more definite direction to abstract thought.

[2] vii. 16.

[3] vii. 20.

of equal honors with the gods.[1] As a test, let them go outside the walls, and he will try to cut off the head of Apollonius with his sword. If he succeeds, Apollonius is innocent of the claim to divinity. If he is terror-stricken and the sword falls from his hand, that is a proof at once of the divinity of Apollonius and of his guilt.

Here the histories are given of some of the other prisoners, who are deploring their fate. The philosopher, in accordance with his professional character, calls them together and addresses to them a consolatory discourse which gives them fortitude and hope. Telling them first not to despair before their cases are decided, he proceeds in a more elevated strain. During the whole of our life, the body is the prison of the soul; and those who dwell in palaces are more under this bondage than those whom they put in bonds. Nor is a savage mode of life a protection. The Scythian tribes are no freer than we are; but are surrounded with hardships by rivers impassable save when frozen over by the cold of winter, and shrink even within the shelter of their wagon-huts. And, if it is not puerile to recur to the fables of the poets,[2] one might tell of gods who are said to have been bound in chains, both in heaven and on earth. Think finally of the many wise and blessed men who have suffered at the hands both of licentious peoples and tyrannies, and resolve not to be surpassed by them in courage.

The next day, an emissary of Domitian comes in the guise of a much-dejected prisoner, but Apollonius sees his purpose of entrapping him, and discourses to his fellow-prisoners only of his travels. On the evening of the fifth day, one from Aelian brings him the message that he is to be led before the Emperor on the morrow; renewing the advice not to be contemptuous, and describing Domitian's appearance and manner of speaking. The fact that Apollonius had come forward to undergo danger on behalf of others, Philostratus here remarks, made a favorable impression even on those who before were prejudiced against him. While he is being led under guard to the Emperor's presence, he rallies his

[1] vii. 21 (1): *τὸ γὰρ προσκυνεῖσθαί σε ὑπὸ τῶν ἀνθρώπων διαβέβληκεν ὡς ἴσων ἀξιούμενον τοῖς θεοῖς.*

[2] vii. 26 (5): *εἰ δὲ μὴ μειρακιώδης ὁ λόγος.*

Assyrian disciple on the mortal terror he is in. Damis—who ingenuously confesses how terrified he is—is not admitted; and Domitian insists that the philosopher shall defend himself alone from the charges, and not Nerva, Rufus, and Orfitus, who are already condemned. Apollonius, nevertheless, declares them innocent, and protests against the injustice of assuming their guilt before their trial. Domitian, now telling him that as regards his defence he may take what course he likes, has his beard and his hair shorn, and puts him in fetters such as are reserved for the worst criminals. A letter attributed to Apollonius in which he supplicatingly entreats the Emperor to release him from his bonds, Philostratus pronounces to be spurious.[1]

When Apollonius has been lodged in his new dungeon for two days, a Syracusan who is "the eye and tongue of Domitian," visits him under the pretence that he is a well-wisher and has gained access to him by payment. After much feigned commiseration he reveals his drift; hinting that Apollonius can easily obtain his release by giving information about the supposed conspiracy against the Emperor. The Syracusan having gone away without result, Apollonius tells Damis that he was once that Pytho of Byzantium who came from Philip on a mission to the Greeks, and whom Demosthenes withstood at Athens. He also predicts that they will suffer nothing more than they have suffered already; and, to show that his submitting to bondage is voluntary, frees his leg from the fetter and then replaces it.[2]

These things, says Philostratus, the more foolish sort ascribe to magic; against the efficacy of which he again takes up the argument. Successful events attributed to charms or sacrifices may be more rationally explained by chance coincidence. Nothing, however, will persuade those who have recourse to such arts that success does not result from performance of the prescribed rites, while failure is to be attributed to the omission of some detail the importance of which was overlooked. Others, he adds, have ridi-

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[1] vii. 35. This letter is not among the extant epistles.

[2] vii. 38.

culed the art at large; but if the young will follow his advice, they will have nothing to do with things of the kind, even in sport.[1] As is evident, he would willingly have ascribed the superhuman powers he conceived Apollonius to have possessed to some deeper knowledge of natural causation. Imperfect as the science of the time was, and credulous as opinion was becoming, philosophic culture repudiated in theory the anti-natural conception of miracle.

Apollonius is at last set free from his bonds, and conducted back to his former prison. His fellow-prisoners welcome him on his return, and he devotes himself unceasingly to giving them counsel. Damis he now sends to Dicæarchia (Puteoli) to expect with Demetrius his appearance after he has made his defence.

When the philosopher is brought to the imperial judgment-seat to be tried, Domitian is to be figured as vexed with the laws because they invented courts of justice.[2] The court was decked out as for a festival oration, and all the illustrious were present. Apollonius, on entering, so disregarded the monarch as not even to glance at him. The accuser therefore crying out to him to "look towards the god of all men," he raised his eyes to the ceiling: thus indicating, says the biographer, that he was looking to Zeus; and thinking him who was impiously flattered worse than the flatterer.[3]

He had prepared an oration in case this should be necessary; but Domitian merely put to him four brief interrogatories. Those he triumphantly answers, and the Emperor acquits him amid applause; telling him, however, to remain so that he may converse with him in private. Apollonius thanks him; but adds a stern reproof. "Through the wretches who surround you," he exclaims, "cities are destroyed, the islands are filled with exiles, the continent with groans, the armies with cowardice, and the senate with suspicion." Then he suddenly disappears from among them.[4]

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[1] vii. 39 (3): *ἐμοὶ δ' ἀποπεφάνθω μηδ' ἐκείνοις ὁμιλεῖν τοὺς νέους, ἵνα μηδὲ παίζειν τὰ τοιαῦτ' ἐθίζοιντο.*

[2] viii. 1: *ἀνατυποῦσθαι δὲ χρὴ οἷον ἀχθόμενον τοῖς νόμοις, ἐπειδὴ εὗρον δικαστήρια.*

[3] viii. 4: *ἐνδεικνύμενος μὲν τὸ ἐς τὸν Δία ὁρᾶν, τὸν δ' ἀσεβῶς κολακευθέντα κακίω τοῦ κολακεύσαντος ἡγούμενος.*

[4] viii. 5 (6).

Since Apollonius composed a speech which he was not allowed to deliver, Philostratus thinks that this too ought to be set before the reader. What he gives is an elaborate defence in which the philosopher repudiates all magical arts and all claims to divinity, except so far as good men may be said to participate in the divine. His life, pure from blood-sacrifice and other pollutions, brings him nearer to the gods, and the lightness of his diet enables him to form presages and hence to be of service to men. In turning men's souls from their vices he is of use to their rulers also, who find them more governable. This being so, if the people did think him a god, the deception would be a gain to the master of the flock.[1] They did not think him a god, however, but only held the ancient opinion that by virtue men can participate in the divinity. A man who has something of divine order in his own soul can by wisdom draw away the souls of others from over-vehement desires of pleasure or wealth. For such an one, it is perhaps not impossible to withhold them from contact with murders; "but to wash them clean," adds the Pythagorean, "is possible neither for me nor for God the Maker of all."[2] He is made to refer to some of the wonders recorded in the biography; but he disclaims the possession of power to keep a dying friend in life or to recover him from the dead. Had it been in his power to do either, he would have done it.[3] In the part of his apology referring to the accusation of having said that if the Fates have determined that a certain man shall reign, then, though the Emperor kill him, he will come to life again, Apollonius points out that such assertions are of the hyperbolical kind adapted to produce conviction in those who find things that are put consistently with the appearance of reason incredible.[4] The implied view is obviously that of the Stoic determinism. If the predetermined event is infallible, its conditions are in reality equally

[1] viii. 7 (21): *ὥστ' εἰ καὶ θεὸν ἡγοῦντό με, σοὶ κέρδος ἡ ἀπάτη εἶχε· ξὺν προθυμίᾳ γάρ που ἠκροῶντό μου, δεδιότες πράττειν, ἃ μὴ δοκεῖ θεῷ.*

[2] viii. 7 (26): *φόνων γὰρ ἀνασχεῖν μὲν αὐτὰς μὴ προσάπτεσθαι οὐκ ἀδύνατον ἴσως ἀνδρὶ τοιούτῳ, ἀπονίψαι δ' οὔτ' ἐμοὶ δυνατὸν οὔτε τῷ πάντων δημιουργῷ θεῷ.*

[3] viii. 7 (46).

[4] viii. 7 (53): *τὰς γὰρ ὑπερβολὰς τῶν λόγων ἐσαγόμεθα διὰ τοὺς τοῖς πιθανοῖς ἀπειθοῦντας.*

necessitated. Unconditional fate is an abstraction; though it is an impressive and a moralising abstraction. In conclusion, he quotes the lines of Sophocles in the *Œdipus Coloneus* on the revolutions of human life—

μόνοις οὐ γίγνεται
θεοῖσι γῆρας οὐδὲ καταθανεῖν ποτε,
τὰ δ' ἄλλα συγχεῖ πάνθ' ὁ παγκρατὴς χρόνος.

Let the Emperor remember how ephemeral is good fortune, and put an end to the oppressions through which he has been made hateful to all, as all things have been made hateful to him.

When Apollonius, as has been related, strangely disappeared,[1] the tyrant did not break out into a rage, as most expected, but rather gave signs of trouble. This having taken place at Rome before noon, Apollonius appeared in the afternoon of the same day at Puteoli to Damis and Demetrius, as he had promised. He came to them when they were beginning to despair of ever seeing him again; and convinced them by having a tangible body that he had not returned from the shades. After he has slept, he tells them that he is about to sail for Greece. Demetrius is afraid that he will not be sufficiently hidden there: to which he replies that, if all the earth belongs to the tyrant, they that die in the open day have a better part than they that live in concealment.[2] To those in Greece who asked him how he had escaped, he merely said that his defence had been successful. Hence when many coming from Italy related what had really happened, he was almost worshipped; being regarded as divine especially because he had in no way boasted of the marvellous mode of his escape.

Of this residence in Greece one singular adventure is related. Apollonius desired to visit the cave of Trophonius at Lebadea in Bœotia. The priests refused to admit him; making excuses to him personally but alleging to the people as their ground his being a sorcerer. He went, however, in the evening with his companions and forced his way in. In this he did what was so pleasing to the god that Trophonius appeared to the priests and rebuked them. To the inquiry of Apollonius, what philosophy he regarded as the

[1] viii. 8: *δαιμόνιόν τε καὶ ῥᾴδιον εἰπεῖν τρόπον.* [2] viii. 14.

best and purest, he replied by allowing him to carry off a book containing the Pythagorean precepts. This book, says Philostratus, is now at Antium; and his own opinion is that it was brought with some of the epistles of Apollonius to the Emperor Hadrian, and left in the palace there.[1]

A concourse of disciples from Ionia joined with those of Hellas to surround the philosopher; and rhetoric lay neglected as an art that can teach only language. He kept his disciples away from the forensic orators (τοὺς ἀγοραίους); having always been hostile to them, and now, since he had seen the Roman prisons, regarding them and their money-making art as more responsible for the state of things there than the tyrant himself.[2]

About this time a crown (στέφανος) was seen around the sun obscuring its rays. The portent was fulfilled when Stephanus plotted the death of Domitian, then fresh from the murder of Flavius Clemens. Stephanus, says Philostratus, being the freedman of his wife—who was, like Clemens himself, a relation of Domitian, though not his sister, as Philostratus has it—avenged his death by attacking the tyrant with a spirit equal to that of the most freeborn Athenians. He proceeds to give an account of the tyrannicide, which, as we see, he approves in entire consistency with classical ethics. While this was taking place in Rome, Apollonius—having returned to Ionia after a stay of two years in Greece—was speaking at Ephesus. Interrupting his discourse, which had gradually become troubled, he stepped forward three or four paces and cried out, "Strike the tyrant, strike!" Then he told his audience that Domitian had been slain at that hour; and this vision of his from the gods was afterwards confirmed circumstantially.[3]

Near the end of Nerva's brief reign (96–98) he disappeared from among men, in some way that is not precisely known; for he sent Damis away when the expected time approached, on the pre-

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[1] viii. 19, 20.

[2] viii. 22. Cf. Tac., *Dial. de Oratoribus*, 12: "nam lucrosae huius et sanguinantis eloquentiae usus recens et malis moribus natus, atque, ut tu dicebas, Aper, in locum teli repertus."

[3] viii. 26.

text of entrusting him with a confidential letter to the Emperor. Damis does not even tell his age, which some make to have been eighty, some over ninety, and others more than a hundred. According to Philostratus, his statues in the temple at Tyana showed him to have possessed in a pre-eminent degree the charm which is sometimes found to accompany old age. Several legends are related of the manner in which he was called from earth.[1] He always taught the immortality of the soul, but did not encourage the indulgence of curiosity about its future. To a disputatious youth who, even after his departure, continued to argue against immortality, he appeared in a vision and delivered an oracle. If the verses[2] are by Apollonius, he would seem to have anticipated the attitude of Kant at the conclusion of his *Träume eines Geistersehers*. Philostratus lastly tells us that he has found no tomb or cenotaph of Apollonius anywhere, but that everywhere he has met with marvellous stories.

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The effect of the work of Philostratus on cultivated opinion was decisive. Apollonius was henceforth recognised as at least a philosopher and perhaps something more. Not that the marvels related produced this effect. No school was led by them to call itself after the name of Apollonius, and no one appealed to his wonder-working as evidence of the truth of the doctrines attributed to him. The feeling seems to have been—and, as we shall see, an adherent of the new religion was not entirely exempt from it—that here was undoubtedly a genuine moral and religious teacher. When, however, the struggle between Christianity and the established polytheism reached its critical point, it occurred to one advocate of the old religion to select the Life of Apollonius as containing wonders better authenticated than those appealed to by the Christians. The argument of Hierocles, so far as it can be gathered from Eusebius, was this: "You proclaim Jesus a god on account of a few prodigies recorded by your evangelists. We have writers of more education than yours and with more care for truth, who re-

[1] viii. 30. [2] viii. 31 (3).

late similar wonders of Apollonius; and yet we, showing more solid judgment, do not make him a god on account of them, but only regard him as a man found pleasing to the gods." This is practically all that Eusebius tells us about the contents of the work written by Hierocles under the title *Philalethes*. Everything else in the book, he asserts, has been urged by others and has been already replied to. The parallel between Apollonius and Christ is all that is new, and this only will be taken up. What seems especially to have stung the father of ecclesiastical history is the taunt of Hierocles about the "heedlessness and lightness" (εὐχέρεια καὶ κουφότης) of Christian belief, to which he recurs again and again. A brief analysis of his argument will not be uninstructive.

He will waive, he tells us, such points as this,—that the coming of Christ alone was foretold by the wise men of the Hebrews under divine inspiration, and that to this day devils are cast out by the power of his name, as the writer can testify from experience.[1] Of the biographers referred to by Hierocles—namely, Maximus of Ægæ, Damis the Assyrian, and Philostratus the Athenian—it will be sufficient to consider the last. From his trustworthiness, that of the rest may be judged. Accordingly the method of Eusebius is to examine in succession the eight books of Philostratus, pointing out in each the inconsistencies and incredibilities of the narrative. I have no objection, he says, to placing Apollonius as high as any one likes among philosophers. But when his biographer, be he Damis the Assyrian, or Philostratus, or any one else, represents him, under cover of Pythagoreanism, as going beyond the bounds of philosophy, then he is really made out to be an ass in a lion's skin, a juggling quack instead of a philosopher. There are limits set to human powers which no man may transgress; though a higher being may condescend to the conditions of human nature.

Was Apollonius then a divine being? If so, let the biographer preserve consistency through the whole narrative. He is said to have been announced to his mother before his birth as an incarna-

[1] *Adversus Hieroclem*, 4: εἰσέτι καὶ νῦν τῆς ἐνθέου δυνάμεως τὴν ἀρετὴν ἐπιδείκνυται μοχθηρούς τινας καὶ φαύλους δαίμονας ψυχαῖς ἀνθρώπων καὶ σώμασιν ἐφεδρεύοντας ἀπελαύνων διὰ μόνης τῆς ἀρρήτου προσηγορίας αὐτοῦ, ὡς αὐτῇ πείρᾳ κατειλήφαμεν.

tion of the god Proteus, and swans are said to have sung him into the world. Whence did the writer get this? It cannot have been from a disciple who joined him long after in Nineveh.[1] In one place he is made to describe himself as knowing all languages without learning them. Yet he is said to have acquired the Attic mode of speech by discipline and attention, and not by nature, and to have been taken by his father to a rhetorician at Tarsus. Many things related of him, Eusebius allows, are credible as belonging to the history of a wise and good man. It is the attempt to ascribe to him a nature more than human that gives ground for blaming both the author and the subject of the biography.

Passing from the first to the second book, Eusebius points out inconsistencies in the account of the journey to India and the meeting with King Phraotes. He then dwells on the marvellous tales about India related in the third book. Behold, he exclaims, the incredibilities in which "Philalethes" glories; preferring Philostratus to our divine evangelists not only as a man of highest education but as careful about truth![2] Iarchas, the chief teacher among the Brahmans, is represented as sitting, in the manner of a satrap rather than of a philosopher, on a more elevated and more adorned seat than his fellows. This outward distinction by the marks of tyrannic privilege was a fitting mode of doing honor to the teacher of divine philosophy.[3] The account by Philostratus of the vegetative growth like wool that enables the philosophers to dispense with clothing made from materials furnished by animals seems to require that we should think of them as laboring at the loom,—unless we are to suppose that this substance of its own accord changes into their sacred raiment.[4] That Apollonius praised the automatic mechanisms of the sages is inconsistent with his not caring to know of them in detail or to emulate them.[5]

Not till the return of Apollonius from India does the biographer, in the fourth book, make him begin his wonderful works. Yet, had he been of a diviner nature than that of man, one would

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[1] *Adversus Hieroclem*, 8. Cf. 12. [2] *Adversus Hieroclem*, 17.
[3] *Ibid.*, 18. [4] *Adversus Hieroclem*, 23. [5] *Ibid.*, 25.

say that he ought to have begun them long before, without need of communicating with the Arabians and the Magi and the Indians. Eusebius then scornfully comments on the account of his destroying the plague of Ephesus. The story about the ghost of Achilles, he proceeds, is also full of absurdities and inconsistencies. The ghost appears at dead of night and disappears at cockcrow; circumstances which would be appropriate enough in the case of evil demons, but are out of place when related of the soul of a hero. The "heedlessness" of the writer in his accounts of the casting out of a demon from a young man, and of the chasing away of the lamia, does not need much elaboration of proof; for this, as they say, is a casting out of demons by demons.[1] The raising of a maiden from death to a second life is most incredible, and to Philostratus himself seems a marvel to be explained away.[2] Had such a wonder really been performed by Apollonius at Rome, it would hardly have escaped the attention of the Emperor and of all his subordinates, and especially of the philosopher Euphrates who at that time was there, and who would not have failed afterwards to include this among his accusations of magic.

In his interviews with Vespasian, this steersman of an Egyptian ship—for such Apollonius told the Indian sage that he had been in a former life—gives himself the airs of a god and of a king-maker. He commends Euphrates to Vespasian; and afterwards, when he is at variance with him, speaks of him to Domitian as the worst of men. How does Philostratus reconcile this with the prescience he attributes to his hero? Evidently, if the wonders related by the writer actually took place, Apollonius performed them by the aid of a demon. Had the superhuman insight he displays on some occasions been of a divine character, he would have displayed it always, and would never have needed to inquire about anything. The fact that he foreknows some things and not others is best explained by the theory of demoniac assistance.[3] As was

[1] *Adversus Hieroclem*, 30: *δαίμονας γὰρ ἀπελαύνει ἀλλῳ ἄλλον, ἤ φασι, δαίμονι.*

[2] *Ibid.*: *ἀπιστότατον καὶ αὐτῷ δόξαν τῷ Φιλοστράτῳ παραιτητέον.*

[3] *Adversus Hieroclem*, 35: *ὅρα δὴ οὖν, ὡς ἔφην, τὴν πᾶσαν αὐτῷ παραδοξοποιίαν, ὡς διὰ δαιμονικῆς ἀπετελεῖτο ὑπουργίας.*

said above, he could drive away a demon like the lamia by a more powerful demon.

From the accusation of magic that was brought against Apollonius his biographer is anxious to defend him. The incident in the dungeon, however, by which Damis is said to have been first convinced of his superhuman powers, if true, plainly confirms the charge. The explanation here suggested by Eusebius is that an impression made on the imagination of Damis by his master's associate demon (ὑπὸ τοῦ παρέδρου δαίμονος) caused him to see the fetter apparently removed and then replaced.[1] Apollonius, it is here evident, did not know the future; for he prepared a long defence which, in the event, was not needed. Moreover, if we examine that defence, we shall find a sufficient justification of the charge of magic by merely comparing his own definition of a sorcerer as a professor of false wisdom (ψευδόσοφος) with the things recorded of him by Philostratus. In what he says to Domitian about the words he had uttered on Necessity, he evades the true charge that he had predicted his end; and is thus placed before us as a flatterer and a liar and anything rather than a philosopher. Perhaps, however, the falsehood comes from his biographers. In that case, where are the "men of highest education" of "Philalethes"? The splendor of the truth has convicted them as plainly liars and uneducated men and jugglers.[2]

Lastly, says Eusebius, arriving at the culmination, Philostratus, having thrown doubt on the place and manner of his departure from life, will have it that Apollonius went to heaven bodily, accompanied by an unexpected song of maiden voices.[3]

Selecting now, as an example of his false doctrine,[4] the utterances attributed to him on the certainty of fate, Eusebius ends with some commonplace libertarian declamation:[5] remarking finally that, should any still think fit to place Apollonius among philosophers, he does not object, if only they will clear him of the false

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[1] *Adversus Hieroclem*, 39.

[2] *Adversus Hieroclem*, 43: ψεύστας ἐναργῶς καὶ ἀπαιδεύτους καὶ γόητας τῆς ἀληθείας τὸ φέγγος διήλεγξεν.

[3] *Ibid.*, 44. [4] ἡ ἐν δόγμασι ψευδοδοξία τἀνδρός. [5] *Ibid.*, 45–48.

ornaments affixed to him by the writing under examination; the real effect of such additions being to calumniate the man himself under the guise of raising him to divinity.

* * *

The moral of the Bishop of Cæsarea's tract is, it may be hoped, too obvious for comment. We may go on now to consider briefly an interesting problem raised by the reforming activity of the philosopher or prophet of Tyana.

Eusebius does not suggest that Philostratus himself had either a hostile or a friendly intention with regard to Christianity. Yet it seems likely that, living when he did, he had some slight bias one way or the other. One passage might be adduced in support of the former view. The declaration of Apollonius, that not even the supreme Deity can wash away the stain of murder, if it were found in Julian, could safely be set down as pointed against the Christian ecclesiastical doctrine. To Philostratus, however, it probably appeared as simply a re-affirmation of the higher ethical view, at once poetic and philosophic, against the imaginations of the multitude that by prayers or ceremonies the necessary expiation to be undergone by the soul itself—perhaps in a series of lives —can be dispensed with. This idea of an inflexible moral order, not to be derived from arbitrary volitions, severe or indulgent, was an important part of the Hellenic conception of an ethically reformed religion; but, to bring it into relief, no contrast was needed except that which Plato had drawn between the philosophic thinker on religion and the popular "medicine-man." The aim of Philostratus, in spite of his introduction of marvels, was to make it quite clear that Apollonius was not this kind of person; and indeed the position about sacrifices which by universal consent was his ought to be of itself sufficient to prove that he was not.

While there is thus nothing to show hostility to Christianity on the part of Philostratus, there is some slight evidence of a not unfriendly intention. The Syrian emperors of the third century, for whom he wrote, were themselves favorably disposed to the new religion. And in representing Apollonius as accused of perpetrating a ritual murder, may he not have meant to hint at the absurd-

ity of the vulgar accusations against the Christians? This seems at least possible. That Christianity should become the exclusive religion of the State he would certainly not have desired. What he hoped for was, we may judge, a system of toleration accompanied by ethical reform of the local cults wherever such reform might be needed. Of Christianity itself he probably knew little. He was not one of those who had caught a glimpse of the theocratic aims of the Church.[1] Indeed Themistius the Peripatetic, and Ammianus Marcellinus the military historian, had scarcely appreciated those aims in the latter part of the fourth century. Even after the victory of Christianity they seem to have still cherished dreams of a mutual toleration; taking the ground natural to sensible men of the world imbued with secular culture who saw the general agreement of all the organised doctrines, philosophic or religious, on practical morals. They could hardly have imagined that what must have seemed to men of their type so moderate and obvious a solution would have to wait, not for its triumph but for a mere beginning of its effective recognition, to the time of Locke.

The *régime* of "religious liberty," desirable as it must always have seemed to statesmen who were not bigots, has not always been practicable for governments sincerely anxious to uphold freedom of opinion. The repression of the rising Christian Church in the second century was probably, in its inception, a policy similar to the legislation of modern States against the reactionary conspiracies fomented by Catholic organisation in its death-struggle; though the exact degree of knowledge of those who attempted it, and the degree of harshness in the methods used, may be forever impossible to discern through the cloud of ecclesiastical legend.

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[1] In spite of its defective information on the detail of Jewish antiquities, there is evidence in the fifth book of his *Histories* that Tacitus had gained some real insight into the spirit of intolerant theocracy which, at once dislodged and liberated by the destruction of Jerusalem, was shaping for itself a new embodiment in the incipient Catholic hierarchy. See especially c. 5. On the support furnished by theocracy to monarchy, compare what he says about the Hasmonæan kings, "qui mobilitate vulgi expulsi, resumpta per arma dominatione fugas civium, urbium eversiones, fratrum coniugum parentum neces aliaque solita regibus ausi superstitionem fovebant, quia honor sacerdotii firmamentum potentiæ adsumebatur" (*Hist.* v. 8).

An attempt to show how a more clearly conceived policy of the kind, aided instead of thwarted by accident, might have been successful in throwing Christianity back on the East, has been made by M. Renouvier in his *Uchronie.* According to M. Renouvier's hypothetical reconstruction of history, the official Stoicism retains the direction of opinion; the extra-legal power of the Emperor is gradually reduced with a view to the restoration of the Republic; slavery is brought to an end by legislation under the continued Stoical influence, instead of being left, as it actually was, to be slowly extinguished in the Middle Ages through economical causes unassisted by directing ideas. The process of return from the type of society initiated by the Cæsarean revolution being thus accelerated, Europe about the ninth century is a little in advance of what actually became its condition in the nineteenth. The empire of the West has in the meantime been resolved into a system of national republics in friendly alliance. The Christian propaganda is re-admitted when the force of the Catholic idea has spent itself in the East in mutual massacre and abortive crusading. Thus, in the hypothetical reconstruction, formal toleration of all sects, religious or philosophic, becomes at length the official system, as it is in the actual modern world after a far more wasteful struggle.

It is tempting to take this sketch as a basis and to make modifications in it by giving a more definite part than M. Renouvier does to the Neo-Pythagorean and Neo-Platonic movements. To bring about, for example, the abolition of the customs of animal sacrifice and of divination by inspection of victims, the ideas of a reformer like Apollonius were necessary; Stoicism having somewhat derogated from its philosophical character by defending the official religion as a whole. Again, to an idealist the Neo-Platonic metaphysics ought to seem an advance on the Stoic materialism. And indeed it seems clear that, in the absence of Christianity, Neo-Platonism and not Stoicism would finally have assumed the direction of opinion in the Empire. Had this been the course of events, Græco-Roman civilisation would have preserved its organic continuity, and the barbarian attack would doubtless have been thrown off. In the latter part of the second century the conservative

patriotism of Celsus foresaw that, as things were, the latent civil war kept up by the *imperium in imperio* of the Church would be fatal; that, unless the Christians could be persuaded to yield the required allegiance to the State, the whole fabric would sooner or later go down under the shock of invasion. He did not indeed foresee the recovery; but expressed the apprehension that the religion of the Christians itself, as well as true philosophy, would be submerged in universal chaos. This, as we know, did not in the end come about; though the prospect might seem near being realised in the dark centuries of the West between the end of antiquity and the beginning of new life in the Middle Age. What then would have been the result if the break-up had been averted? Would Western civilisation have assumed a fixed form analogous to those of the East though superior,—combining, let us say, the political order of China with the higher speculative thought of India and with a legal system that recognises rights as well as duties, but never developing new forms of freedom or new lines of art and thought? Or would there have been such accelerated progress as M. Renouvier has imagined?

A progressive movement might be conceived as starting from interaction between the Roman Empire and the free but undisciplined tribes of the North, when these, kept at length within their own boundaries, settled down to a life of comparative peace and began to draw their higher culture, as they would have done, from the old civilisation of Europe. We might then suppose an ethnic republic arising in the North—say, in Scandinavia—and, by offering to the South a new type for imitation instead of the city-republic of the past, leading to a system of independent national States. As the imperial absolutism, according to the hypothesis, remains unconsecrated by a new hierocracy, we should naturally suppose a transition from the monarchical to the republican form less violent than the French Revolution. Thus we should come round to M. Renouvier's result in a different manner. It would be easy to fill in details and, by selecting factors with a view to the required product, to show how every distinctive element in modern civilisation might have been evolved.

M. Renouvier himself, however, at the conclusion of his "apocryphal sketch," has sufficiently indicated at once the possibilities and the limitations of this kind of reconstruction; and the scientific interest of any such attempt cannot, of course, be in its positive result—since the result is necessarily unverifiable—though it may suggest new ways of looking at the actual process of history. We are led to see that in the complexity of real circumstances factors intervene which from time to time make continuous progress impossible.[1] Perhaps it is irrational even to desire that there should have been continuous progress; as Heraclitus thought Homer irrational for giving utterance to the aspiration "that strife might be destroyed from among gods and men"; since this would mean the destruction of the cosmic harmony itself. It is still possible to apply the teleological idea in Kant's sense to the historical process. That is to say, we may use it as a "regulative idea" to interpret history as it was; though we may not use it to inform us as to what history in general must have been. Taking it in the first sense, and using the terms of post-Kantian metaphysics, we might regard the pseudo-synthesis of Athanasius and Augustine and the rest, itself entirely without human value, as the obstacle posited by the world-soul in order to rise more explicitly to the idea of spiritual freedom. This is not of course to deny that there are gleams of borrowed light in their Kingdom of Darkness; but it is to deny the too anthropomorphic teleology of Comte, with its insistence that the Catholic ideal, as one expression of the "human providence," must have been a progressive phase in the history of humanity.[2] The immanent reason in things, being cosmic and not simply human, works in the affairs of man also through pauses like night and winter.

Such seasons, we know, bear the germs of the future; and the

[1] A recent example of this kind is the overgrowth of industrialism throughout the civilised world. It is remarkable that two poets so unlike in many respects as Wordsworth and Shelley foresaw the imminent evil of plutocracy in the early years of the nineteenth century.

[2] Comte predicted results almost purely beneficent from modern industrialism; though it must be allowed that his disciples have no more love for the present hypertrophy of commerce than other philosophers.

future is more than simply a return to a vanished past. To historical Christianity may be assigned on one side the merit of partially appropriating the idealistic metaphysic which was the legacy of Hellenic thought; and, on the other side, of preserving, in the documents to which it appealed for its authoritative dogma, elements of ethical culture which, when cleared of their dogmatic superstructure, could be seen to contain something emotionally unique. In the Hebrew prophets there is a more ardent, though not a purer and certainly not a nobler, morality than that of classical antiquity even in its final stage; and the teaching of the Gospel has become, when disassociated from a creed which was always extraneous to it, the inspiration of a more impassioned, though not of a wider, philanthropy. The first modern to bring out clearly the permanent ethical value of the Christian as well as of the Hebrew documents was Spinoza, who was enabled to do it by having discarded more systematically than any one before him the whole framework of rabbinical and ecclesiastical dogma. Since, however, the problem of making a new synthesis of the elements of ethical and intellectual culture still remains, there seems to be some advantage in returning for inspiration to more than one source. The movement of moral and religious reform from within the Hellenic world failed, owing to the circumstances of the time, as much through its merits as through any shortcomings that may be ascribed to it. Its philosophical idea of divine justice, as we have seen, was opposed to the doctrine of vicarious punishment distilled by Christian theology from the lower paganism. And for a time the original Christian teaching, such as Biblical critics now suppose it to have been, failed more tragically than the Hellenic movement. Græco-Roman civilisation indeed was broken up; and the Christian Church conquered: but, on the other hand, the genuine Hellenism has been easier to rediscover than the teaching of Jesus, which, in its association with the ecclesiastical system, became distorted almost if not quite beyond recognition. In the endeavor after restoration, may not the "Hebraist" and the "Hellenist," in the true sense of both terms, regard themselves as co-operating to a common result?

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SKETCH OF THE ORIGIN AND DEVELOPMENT OF GEOMETRY PRIOR TO 1850.[1]

[CONTINUED.]

THE intellectual movement which went out from Italy in the period of the Renaissance continued, as already said, under the direction first of France and then of England and Germany. But toward the end of the eighteenth century, after Euler had ceased to "calculate and to live"[2] and Lagrange (1736–1813) had pitched his tent in France, this country put itself once more at the head of the mathematical world. Not only by Clairaut, D'Alembert[3] (1716–1783), Condorcet (1743–1794),[4] Laplace (1749–1827), Legendre (1752–1833), Ampère (1775-1836),[5] Poinsot (1777–1859), Poisson (1781–1840),[6] and other lesser men, did this country direct the study of higher analysis and mathematical physics, but it also led scientists back to the study of the geometric forms in the sense—*mutatis mutandis*—in which that was understood by the learned men of old. This was accomplished by the work of Monge,[7] Carnot[8] (1753–1823) —disciple of Monge at the school of engineering of Mézières—and Poncelet[9] (1788–1867), the splendid triad on whose memorable pro-

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[1] Translated from the Italian of Loria by Dr. George Bruce Halsted.

[2] Expression used by Condorcet in his *Éloge de M. Euler.*

[3] J. Bertrand, *D'Alembert* (Paris, 1889).

[4] Arago, *op. cit.*, 2, 1854. [5] Arago, *loc. cit.* [6] Arago, *loc. cit.*

[7] See Charles Dupin, *Essai historique sur les services et les travaux scientifiques de Gaspard Monge* (Paris, 1819); Arago, *loc. cit.*; K. Fink, "Monge" (*Korresp.-Bl. f. d. Gel. und Realschule*, Tübingen, 1892, pp. 263–289, 339–359).

[8] Arago, *op. cit.*, 1, 1854; K. Fink, *Lazare Nicolas Marguerite Carnot. Sein Leben und seine Werke nach den Quellen dargestellt* (Tübingen, 1894).

[9] See E. Holst, *On Poncelet's Betyding for Geometrien* (Christiania, 1878). Bertrand, *Éloges académiques* (Paris, 1890).

ductions we must pause an instant. The first, by uniting in one body of doctrine the few rules of perspective which the architects and artists had created for themselves, impelled by needs which they felt while cultivating their arts, and filling up with felicitous genius the many serious gaps which their ensemble presented, united his own name with a new branch of geometry, *descriptive geometry.*[1] Here is not the place to summarise the first known treatise of such branch of mathematics; we only note that if its publication had a practical and almost national motive,[2] Monge also attributed to the new science a theoretical value derived from the facility with which it enables one to conceive and then to study geometrical figures; moreover he was careful to compare his processes with those proper to analysis, showing their essential identity. By the classical works just cited and still more by the incomparable lectures at the polytechnic school of Paris,[3] of which he was one of the first and most splendid ornaments,[4] he put anew in honor the

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[1] Whoever desires further particulars relating to the prehistory and history of descriptive geometry is referred to the first section of Vol. I. (Leipzig, 1884) of the *Lehrbuch der darstellenden Geometrie* of Chr. Wiener (1826–1896). Here let it suffice to mention *La théorie et la practique de la coupe des pierres et des bois ou Traité de stéréotomie* (1738–1739) of Frézier (1682–1773).

[2] In fact the *Programme* prefixed to it commences with the words: "Pour tirer la nation française de la dépendance où elle a été jusqu'à présent de l'industrie étrangère etc." (Monge, *Géometrie descriptive*, Paris, an VII.)

[3] See Arago, *op. cit.*, 3, 1855, p. 70 and following; Jacobi, "Ueber die Pariser polytechnische Schule" (*Ges. Werke*, 7, Berlin, 1891, pp. 355–370).

[4] Monge had for collaborators in his work of reform several colleagues—among others Lacroix (1765–1843) and Hachette (1769–1834)—and many scholars. Among these it is but just to make here special mention of Charles Dupin (1764–1873) who "above the others like an eagle soars," thanks specially to his two works *Développements de géométrie* (Paris, 1813) and *Applications de géométrie et de mécanique* (Paris, 1822) of which we shall have occasion to speak further on; meanwhile we here mention the eulogy written on him by Bertrand (*Éloges academiques*, Paris, 1890) and the article "Dupin" by K. Fink (1851–1898) (*Korresp.-Bl. f. d. Gel. und Realsch.*, 1893, pp. 1–27). Nor can we omit making honorable mention also of the *Mémoire sur les lignes du second ordre* (Paris, 1817) and of the *Application de la théorie des transversales* (Paris, 1818) of Brianchon (1783–1864), writings of which the first contains the fundamentals of a synthetic theory of conic sections, with special regard to their construction, founded in part on the theorem of Pascal and its correlative (which Brianchon himself made known in the XIII cah. of the *Journ. Éc. Pol.* and afterwards generalised in the Vol. IV. of the *Ann. de Math.*), in part on anharmonic ratio; while the second aims to show of what

study of geometry founded on the direct consideration of the figures which are its object, and facilitating the conception of geometrical figures of three dimensions, he prepared for the application of stereometric considerations to the research of the properties of plane figures, which Pappus had only vaguely seen (see § 5) and which represents to-day one of the most fertile methods of investigation and demonstration that geometry boasts of.[1]

By the side of the *Géométrie descriptive* of Monge must be placed the *Géométrie de position* (Paris, 1803) of Carnot, the latter having as object in common with the former to give geometry that generality of concepts and methods and in consequence that clear and disinvolved procedure which were believed to belong exclusively to algebra. The reader who knows only the title of the most important geometric work of the "organiser of victory" might believe that its subject coincides with that unfolded by the modern works on projective geometry. Nothing would be more inexact; the intention which Carnot set himself is to determine the mutual dependence which exists between the different aspects which may be assumed by a figure satisfying certain conditions in correspondence with the various positions of which the data are susceptible, a study enabling us to dispense with that minute enumeration of

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fecundity for constructions are the theorems of Menelaus and Ceva, an aim analogous to what Servois (1767–1847) (comp. J. Boyer, *Le mathématicien Franc-Courtois François Joseph Servois*, Besançon, 1895) contemplated in composing his *Solutions peu connues de différents problèmes de géométrie pratique* (Paris, 1805).

[1] The influence of Monge was not limited to France and the neighboring countries; this is proved by the writings of Garbinski (1796–1848) and Sapalski (1791–1838), viz., the *Synthetic Exposition of the Properties of Ruled Surfaces* (Warsaw, 1822) of the former and the excellent treatise on descriptive geometry (Warsaw, 1822 and 1849) of the latter. Moreover such influence was not quickly spent, since it may still be recognised in the methods of teaching elementary geometry; this is proved by the attempt to do away with the old rigorous separation between planimetry and stereometry made for the first time by Bretschneider (1808–1878) in 1844 (*Lehrgebäude der niederen Geometrie*), repeated later by Méray (*Nouveaux éléments de géométrie*, Paris, 1875), and successfully accomplished in 1884 by De Paolis in his excellent *Elementi di geometria* (Torino). With respect to the influence of Monge on the recent development of graphic methods see H. T. Eddy, *Modern Graphical Developments* (Math. Papers read at Chicago Congress, New York, 1896).

the various cases of the figure, to which the ancient geometers were constrained. Such aim is to-day attained by a path much more smooth and clear, that is by the methodical use of the signs in geometry; for this reason the *Géométrie de position* presents to-day little more than historical interest, and must be mentioned less on account of the ideas set forth, than because of the applications there given, among which we mention here the principles of polygonometry and of polyhedrometry, the theory of barycenters and the theory of transversals, a conspicuous part of which is the celebrated proposition which is to-day designated as Carnot's theorem.[1] It is well also to notice here that the memoir *De la corrélation des figures de la géométrie* (Paris, 1801) is a first sketch of the *Géométrie de position*, while the *Lettre du citoyen Carnot au citoyen Bossut* (Paris, 1799) and the *Mémoirs sur la relation qui existe entre les distances respectives de cinq points quelconques pris dans l'espace* (Paris, 1806) have with it numerous points of contact; that further the *Réflexions sur la métaphysique du calcul infinitésimal* (Paris, 1796) form an integral part of the *Géométrie de position*, as some suppose, is something that cannot be accepted without mature examination and engthy discussion.

The writings of Monge and Carnot prepared effectively for the revival of pure geometry; this must be dated from the appearance (1822) of the *Traité des propriétés projectives des figures* of Poncelet.[2] To convince the reader how memorable is this date, it is sufficient to notice that it is in Poncelet's great work that is demonstrated the power of central projection and of the principle of continuity as instruments of research and auxiliaries in demonstration;[3] that

[1] We believe it opportune to note also that Carnot uses the word *equipollence* in a sense analogous to that in which much later it was used by Bellavitis.

[2] Only in passing we mention the fierce war waged on this work when just issued, which was in a great part due to Poncelet's ideas not having been understood.

[3] Whether the ancients knew how to employ perspective in theoretical research is a question which we cannot here examine (see Chasles, *Aperçu historique*, 2d ed., p. 74, note); the analogous question concerning the principle of continuity is studied by C. Taylor in the note "On the History of Geometrical Continuity" (*Cambridge Proc.*, 1880 and 1881) and in the preface (pp. LXXIII. seq.) to the work *Ancient and Modern Geometry of Conics*, where, among others, are de-

in it the deeper study of homology in the plane and in space serves, not only as a prelude, but further as most effective preparation, for the study of univocal correspondence between two systems of equal number of dimensions (see Chapter VIII.); that there also the old notions concerning polarity[1] with respect to a conic[2] and those discoveries of Monge's school relating to a quadric surface prepare the law of reciprocity which, recognised by Vieta,[3] by Philip van Lansberg (1561–1632),[4] and by Snellius (1581–1626)[5] in the geometry of the sphere, was destined to be enunciated in all its generality and called by the name of *principle of duality*, four years later (see "Considérations philosophiques sur les éléments de la science de l'étendue," *Ann. de Math.*, 16, 1825–1826,)[6] by Gergonne, (1781–1859.[7]) While an importance rather transitory pertained to the considerations set forth by Poncelet concerning the ideal chords of conic sections,—on which one relating the history of the theory of imaginaries in geometry might pause,—on the other hand great value must be attributed to the *Supplément* of the work in question, from which, among other things, we learn of the existence of four cones in any pencil of quadrics; moreover the investigations concerning polygons inscribed in one conic and circumscribed about

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scribed the efforts of Boscovich (1711–1787) to give a firm basis to the afore-mentioned principle.

[1] The name *pole* was proposed by Servois ("Solution du premier, etc." *Ann. de Math.*, T. I., 1810–1811), that of *polar* by Gergonne ("Théorie analytique des poles, des lignes, et des surfaces du second ordre," *Ibid.*, T. III., 1812–1813).

[2] A special application of polarity is met with in the *Traité analytique des sectiones coniques* (Paris, 1707, p. 275), of the Marquis de l'Hôpital (1661–1704). See also the "Rectifications."

[3] *Variorum de rebus mathematicis responsorum liber octavus* (Tours, 1593).

[4] See K. Fink, *Kurzer Abriss der Geschichte der Elementar-Mathematik* (Tübingen, 1890), p. 196.

[5] *Doctrina triangolorum canonica* (Leyden, 1627).

[6] *Ann. de Math.*, 19, 1827, where one finds for the first time the expression *class of a curve*.

[7] Further particulars on the origin of duality are found in the *Vorlesungen über continuirliche Gruppen* by Lie, edited by G. Scheffers (Leipzig, 1893), a work in which is also set forth a most important generalisation of the dualistic relation. See moreover *Julius Plückers gesammelte wissenschaftliche Abhandlungen*, I. (Leipzig, 1895), p. 619.

another possess permanent value; nay, if the place assigned to a mathematical research should be determined, not so much on the basis of the intrinsic value which it seems to possess, as rather by its originality and the novelty and variety of the investigations which branch out from it, it follows that to the last cited theme belongs a position second to a very few. And on this account and because it is extremely instructive to contemplate all the aspects revealed by modern mathematics in a single and minor subject, we wish to pause an instant on the so-called *polygons* of Poncelet.[1]

13. The problem: "Given in a plane two conic sections, to construct a polygon of a certain number of sides, which shall be inscribed in one of the given curves and circumscribed about the other," seems determinate, and from the year 1817 Poncelet reckoned[2] it among those to which could be applied the methods he was then elaborating; however when we remember that, if the two conics are circles the data must satisfy a certain relation[3] in order that the problem be possible, the suspicion arises that in the general case something analogous takes place. And in fact five years later Poncelet demonstrated that the problem enunciated does not admit, generally speaking, of a solution, but that when it has one, there is an infinite number (*Traité des propr. projectives*, §§ 530 et seq.; see *Applications* cited, 1, Paris, 1862, p. 348 et seq.). This memorable discovery did not pass unnoticed; which is proved by the fact that not more than six years after the time when it became public, Jacobi (1804–1851)[4] in the course of his notable researches

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[1] For greater particulars refer to the "Note historique, critique et philosophique," inserted by Poncelet in the *Applications d'analyse et de géométrie, etc.* I. (Paris, 1862), to the lecture of the author, entitled *I poligoni di Poncelet* (Turin, 1889), and to the complement published in the *Bibliotheca mathematica*, 1889, with the title "Rassegna di alcuni scritti sui poligoni di Poncelet."

[2] "Réflexions sur l'usage de l'analyse algébrique en géométrie," inserted first in the *Ann. de Math.*, 8, 1817, and then in the *Applications d'analyse et de géométrie*, 2 (Paris, 1864), p. 466.

[3] In the case of a triangle this was discovered by Euler (*Nov. Comm. Petrop.*, 2, 1751) and for the other polygons it was investigated by his disciple Nicholas Fuss (1755–1826) (*Nova Acta Petrop.*, 10, 1794, pub. 1797, and 13, 1798, pub. 1827) and found in part by Steiner (*Journ. f. Math.*, 2, 1827).

[4] Lejeune-Dirichlet, "Gedächtnissrede auf C. G. J. Jacobi" (*Berl. Abh.*, 1852).

concerning the theory of elliptical functions observed—in the celebrated paper "Ueber die Anwendung der elliptischen Transcendenten auf ein bekanntes Problem der Elementar-Geometrie" (*Journ. f. Math.*, 3, 1828)—how this theory was able to furnish a complete general solution (nay, the only explicit one, that is to say, other than by a recurring way, which is known even to-day) of the problem which consists in seeking the relations existing between the radii and the distance of the centers of two circumferences which admit a polygon of Poncelet of a given number n of sides. And since, as Laplace thought, "discoveries consist in bringing together ideas capable of uniting and which were before separate," we must without hesitation give to Jacobi's observation the name of discovery. Nor need we wonder therefore at perceiving how the writing just cited was judged by Legendre worthy to be abridged in one of the supplements to the third edition of his voluminous *Théorie des fonctions elliptiques et des intégrales eulériennes*, and that Richelot (1808–1875) thought proper to devote two memoirs[1] to develop and complete the ideas of his own master and also to show how these could be applied to solve the analogous problems of spherical geometry.

At the end of the above mentioned memoir Jacobi noted that through the theory of elliptic functions it would have been most interesting to institute for two conics considerations analogous to those explained by him for two circumferences, even declaring himself disposed to return himself to the subject; but later, probably attracted by more important problems, he did not execute his project, which for nearly forty years waited in vain for some one to execute it; finally in 1865 Rosanes and Pasch gave in the notable memoir "Ueber das einem Kegelschnitte umbeschriebene und einem anderen einbeschriebene Polygon" (*Journ. f. Math.*, 64) a transcendental solution of the problem, which consists in the in-

[1] "Anwendung der elliptischen Transcendenten auf die sphärischen Polygone, welche zugleich einem kleinen Kreise der Kugel eingeschrieben und einem andern umgeschrieben sind." (*Journ. f. Math.*, 5, 1830); "Ueber die Anwendung einiger Formeln aus der Theorie der elliptischen Functionen auf ein bekanntes Problem der Geometrie" (*Ib.*, 38, 1849).

vestigation of the relation which must be satisfied by the coefficients of the two conics in order that there may be a polygon of n sides inscribed in one and circumscribed about the other; generalising as needful the method invented by Jacobi and employing the elliptical functions of Jacobi.[1] That we can reach the same result using the analogous functions preferred by Weirstrass, was shown first by M. Simon[2] and afterwards by Halphen (1844–1889)[3]—in the second volume of his classic *Traité des fonctions elliptiques et de leurs applications* (Paris, 1888)—and by Vivanti.[4]

Having preferred in our exposition the logical order to the chronological, it is necessary to retrace our steps some decades to take note of the extremely elegant works of Nicola Trudi (1811–1884)[5] and those of A. Cayley (1821–1895)[6] not less interesting but much better known and even more widely diffused on account of being included in the collected papers of this celebrated scientist

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[1] The same analytical auxiliaries are employed in Rogers "Note on the Porism of the Inscribed and Circumscribed Polygon" (*Proc. L. M. S.*, 16, 1884–85).

[2] "De relationibus inter constantes duarum linearum secundi ordinis ut sit polygonum alteri inscriptum circumscriptum alteri" (*Diss.*, Berlin, 1867), and "Ganzzahlige Multiplication der elliptischen Functionen in Verbindung mit dem Schliessungsproblem" (*Journal für Math.*, 81, 1876). See Gundelfinger, "Ueber das Schliessungsproblem bei zwei Kegelschnitten" (*ibid.*, 83, 1877).

[3] C. Jordan, "Georges Halphen" (*Journal de Math.*, IV., 5, 1889); "Liste des travaux mathématiques de Georges-Henri Halphen" (*Palermo Rend.*, 3, 1889); Brioschi, "Notizie sulla vita e sulle opere di G. E. Halphen" (*Lincei Rend.*, IV., 5, 1889).

[4] "Sull' applicazione della funzione ellitica pu alla teoria dei poligoni di Poncelet" (*Palermo Rend.*, 7, 1893).

[5] *Sui poligoni iscritti e circoscritti alle curve coniche con date condizioni*, Naples, 1841; "Rappresentazione geometrica immediata dell' equazione fondamentale della teoria delle funzioni ellittiche con diverse applicazioni," *Naples Rend.*, 1843; "Studi intorno ad una singolare eliminazione con applicazione alla ricerca della relazione tra gli elementi di due coniche, l'una inscritta e l'altra circoscritta ad un poligono, ed ai corrispondenti teoremi di Poncelet" (*Napoli Atti*, 1863), and "Sui teoremi di Poncelet relativi ai poligoni iscritti e circoscritti alle coniche" (*Giorn. di Mat.*, 1, 1863).

[6] For biographical data concerning this geometer we refer the reader to the "Biographical Notice" by A. R. Forsyth which introduces Vol. VIII. (1895) of *The Collected Mathematical Papers of Arthur Cayley*; further to the "Notizia sulla vita e sulle opere di Arturo Cayley" by Brioschi (*Lincei Rend.*, V., 4, 1895), translated into French in *Bull. Sc. Math.*, II., 19, 1895; and lastly to the article "Arthur Cayley" by M. Nöther (*Math. Ann.*, 46, 1895).

(see Vols. 2, 3. 4, 5, 8, and 9); regarding these works we shall limit ourselves to note that from those of the English geometer we learn to write under the form of a determinant the simultaneous invariant of two ternary quadratic forms, whose vanishing announces that the conics represented by these admit of a polygon of Poncelet of the given order.

Analogous results were obtained by Mention in the "Essai sur la problème de Fuss" (*Petersb. Bull.*, 1, 1860) utilising an observation set forth by Tchébycheff (1821–1894)[1] in an article "Sur la série du problème de Fuss" (*Id., ib.*); by Puiseux (1820–1883) in the "Note sur les polygones qui sont à la fois inscrits dans un cercle et circonscrits à un autre cercle" (*Annales de la Soc. scient. de Bruxelles*, 3^e^ ann., 1878–1879, 2^e^ partie); by Kluyver in the memoir "Over de invariante betrekking tusschen twee kegelsneden in en om denzelfden velhoek beschreven" (*Nieuw Archief voor Wiskunde*, 15, 1888) and much earlier by Moutard in an article[2] which the originality of its concepts and the amplitude of its views places in a most eminent position among those referring to the theory which occupies us.

Lack of space forbids dwelling on the very numerous works whose modest aim was to demonstrate by methods different from those of Poncelet and Jacobi the results obtained by these, and even on the more significant ones which have for aim the study of the geometrical properties of the polygons of Poncelet.[3] But we wish to note how the theorem established by the great French geometer makes a part to-day of the splendid collection of *theorems of closure* (*Schliessungsprobleme*), to the constitution of which Steiner greatly contributed by discovering in 1832 one relative to circles on the plane or on the sphere (see *Systematische Entwicke-*

[1] A. Vassillief, *P. L. Tchébycheff et son œuvre scientifique* (Loria Bollettino, 1, 1898).

[2] "Recherches analytiques sur les polygones simultanément inscrits et circonscrits à deux coniques," in the appendix to the first volume of the *Applications* of Poncelet already cited.

[3] See in particular: Halphen, "Application de la théorie des caractéristiques pour les coniques à une question relative aux polygones de Poncelet" (*Bull. Soc. Phil.*, VII., 3, 1876).

lung etc.[1]) and one still more noteworthy relative to polygons of an even number of sides inscribed in a plane cubic (*Journ. f. Math.*, 32, 1846), to demonstrate the latter of which many celebrated geometers exerted themselves, among which it is sufficient to mention Clebsch (*Journ. f. Math.*, 63, 1864), Ed. Weyr (*ib.*, 71 and 73, 1870–1871), Schoute (*ib.*, 95, 1883), Hurwitz (*Math. Ann.*, 19, 1882), Küpper (*ib.*, 24, 1884), Disteli (*Die Steiner'schen Schliessungsprobleme nach darstellend-geometrischer Methode*, Leipzig, 1889; see also Fiedler, *Die darstellende Geometrie*, etc., III. Th., p. 352 et seq., Leipzig, 1888), Martinetti (*Palermo Rend.*, 5, 1891), Czuber (*Journ. f. Math.*, 114, 1892). Some analogous propositions are due to August (*Archiv der Math.*, 59, 1876), to Harnack (1851–1888)[2] (*Math. Ann.*, 12, 1877), to Westphal (*Math. Ann.*, 13, 1878), to Forsyth (*Proc. L. M. S.*, 14), to Juel (*Nyt Tidss. f. Math.*, 1, 1890), to J. Thomae (*Leipziger Ber.*, 47, 1895), to R. A. Roberts (*Quart. Journ.*, 29, 1898), and to others whom for brevity we omit.

Instead we observe how the examination of the collection of works referring to the theorems of closure in general gives evidence of an intimate connection between these and the theory of elliptic functions. Now, just as it has been acutely noted[3] that in mathematics the appearance of any contradiction whatsoever indicates the presence of a hidden truth capable of adjusting the momentary discord, so we may say that a point of contact between two heterogeneous doctrines must find its justification in some more general truth. Thus for the theorems of closure, this superior reason consists in this, that every one of them gives rise to a homogeneous relation doubly quadratic between two series of binary variables, that is to a relation of the same form as that which subsists between two elliptic functions with the same argument; this is what Cayley demonstrated in the memoir "On the Porism of the In- and Circumscribed Polygon" and the (2, 2) "Correspondence of Points

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[1] Comp. Vahlen, "Ueber Steiner'sche Kugelketten" (*Zeitschrift*, 41, 1896).

[2] A. Voss, "Zur Erinnerung an Axel Harnack" (*Math. Ann.*, 32, 1888).

[3] H. J. Stephen Smith, "On the Present State and Prospect of Some Branches of Pure Mathematics" (*Proc. L. M. S.*, 8, 1876, p. 25).

on a Conic" (*Quart. Journ.*, 11, 1871).[1] And these observations disclosing that part of the reasoning common to all the demonstrations of the theorems of closure, led Hurwitz to write a memoir[2] in which we know not whether more to admire the breadth of view or the perfection of form, and with which we shall end this digression, for in vain we should seek a more worthy close.

14. The papers of Poncelet "Mémoire sur les centres de moyennes harmoniques" (*Journ. f. Math.*, 3, 1828) and "Mémoire sur la théorie générale des polaires réciproques" (*ibid.*, 4, 1829), as well as the later "Analyse des transversales appliquée à la recherche des propriétés projectives des lignes et des surfaces" (*ibid.*, 8, 1832), make us approach the year 1837, in which was published the *Aperçu historique sur l'origine et le développement des méthodes en géométrie* by Michel Chasles (1793–1880)[3], a fascinating work in which the author, after having set forth in a style the beauty of which may be equalled but not excelled, all that constituted in his time the patrimony of pure geometry, vigorously defended the rights which this had to the consideration of scientists and which were continually questioned by the blind worshippers of analysis. One must not suppose however that this is a work of polemic alone, and that therefore it has, to-day that the strife is over, only a historical value. In fact from the *Mémoire de géométrie sur deux principes généraux de la science*, that follows the historico-critical part of the work in question, we learn the general properties of the collinear and reciprocal transformations whether in general or in the cases in which they are involutory, while in the thirty-four notes which accompany it are given important historical and scientific investigations. Of the first it is not necessary here to make explicit mention, and as to the others it will suffice to limit ourselves to

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[1] See also Chapters IX–X of the second part of the above-mentioned *Traité* of Halphen.

[2] "Ueber unendlich-vieldeutige geometrische Aufgaben, insbesondere über die Schliessungsprobleme" (*Math. Ann.*, 15, 1879); see also the note of the same geometer "Ueber die Anwendung der elliptischen Functionen auf ein Problem der Geometrie" (*ibid.*, 19, 1881).

[3] See J. Bertrand, "Éloge de Michel Chasles" in *Revue scientifique* of March 24th, 1892.

name those on cross ratio, on involution and on the law of continuity, since of the remainder, being more special, it is better to postpone the examination to a more opportune moment.

But in the interval of time interposed between the appearance of the writings of Poncelet and the publication of the work of Chasles, Germany had awakened from the torpor in which for half a century the soporific works of the "combinatorial school"[1] had immersed her,—a torpor from which the powerful voice of Gauss[2] (1777–1855), the *princips mathematicorum*, was not able to rescue her, he whom Jacobi did not hesitate to compare with Archimedes, finding in his works discoveries equally profound with those of the ancient, set forth in a form the most perfect, and with ideal scientific rigor; he whose mental preëminence is manifested, as Borchardt notes, in the decisive influence which he exercised on the mathematics of our time, penetrating in all his researches down to the very heart, clarifying and amplifying the fundamental concepts of mathematics, binding together under general laws facts which had remained unexplained or isolated, and uniting the rigor of the antique methods with the free play of modern analysis.

The reawakening in Germany of the spirit of investigation is marked by a new transference of the mathematical sceptre, which may be considered as having taken place in 1826, the year of the founding by the exertions of A. L. Crelle (1780–1855) of a periodical publication to which Abel (1802–1829)[3] and Jacobi, Steiner and Plücker, Moebius and von Staudt quickly insured renown not destined to decline; and it is precisely to these last four scientists that geometry is indebted for her return in honor to the east of the Rhine: to these it is therefore our duty to dedicate some lines of this introductory chapter.

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[1] The work done by this curious school who consider the polynomial theorem as the most important proposition of all analysis is analysed in Gerhardt, *Geschichte der Mathematik in Deutschland* (München, 1877) pp. 201–206.

[2] See Sartorius von Waltershausen, *Gauss zum Gedächtniss* (Leipzig, 1856); Schering, "Zur Feier der hundertsten Wiederkehr von Gauss' Geburtstag" (*Gött. Nachr.*, 1877).

[3] Bjerkness, *Niels-Henrik Adel. Tableau de sa vie et de son action scientifique* (Paris, 1885).

15. The most important of the works of Moebius (1790–1868)[1] in the field of geometry is that having for title *Der barycentrische Calcul* (Leipzig, 1827)[2]; herein the ancient ideas concerning the mass-center of a system of points are made the foundation of a most important algorithm, which leads to a new system of coördinates, of which the author demonstrates the applicability to the study of plane and twisted curves and to the research of the properties of new geometric transformations. Later applications of the same methods are contained in memoirs which the author inserted in Vols. 5 (1830), 24 (1842), 26 (1843), and 37 (1844) of the *Journ. f. Math.*, while new species of transformations (circular affinity, involution, symmetry, elementary transformations) were set forth by him in other writings, of which we do not cite the titles here in detail, nothing being easier than to find them now that the issue of his *Gesammelte Werke* has been completed. Others of his researches of a different kind will be mentioned later; here we make an exception only in favor of those on the signs of plane and solid figures (which among other things led to the ideas of polyhedra without volume and of unilateral surfaces), on the polyhedra, on the *Ausdehnungslehre* of H. Grassmann (1809–1877) and on the *Quaternions* of W. R. Hamilton (1805–1865), there being no point in our history more opportune for their mention.

Möbius contributed also to the progress of mechanics, of optics, of astronomy, as well as analysis, but these works are without the frame of our picture; if we mention them it is to indicate how they proclaimed a substantial difference between him and another of the stars of first magnitude which in that epoch illuminated the sky of German mathematics, J. Steiner (1796–1863)[3], who was so exclusively geometer that he was never willing to come to terms openly

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[1] See the bio-bibliographic sketch prefixed by Baltzer to *August Ferdinand Möbius' gesammelte Werke* (Leipzig, 1885–1887).

[2] Note how a preceding work on "Zwei geometrische Aufgaben" (inserted in a volume of *Beobachtungen auf der K. Univ.-Sternwarte zu Leipzig*) shows that from 1823 Möbius knew and knew how to employ in a masterly manner the barycentric calculus.

[3] See C. F. Geiser, *Zur Erinnerung an Jacob Steiner* (Zurich, 1874); Graf, *Der Mathematiker Jacob Steiner von Utzendorf* (Bern, 1897).

with the analysts.[1] All know how in his *Systematische Entwickelung der Abhängigkeit geometrischer Gestalten von einander* (Berlin, 1832) "was revealed the organisation by virtue of which the most varied phenomena of space are connected among themselves," how here are rigorously established the principles by means of which that great geometer was able to accomplish the wonderful discoveries which will be separately cited in the course of our narrative; here we wish only to mention, in the first place how the possibility of founding on these a complete treatment of the conic sections appears from the *Vorlesungen über synthetische Geometrie* (Part I., 2nd ed., Leipzig, 1875; Part II., 3rd ed., *ibid.*, 1898) which two eminent disciples of Steiner (Geiser and Schröter) published under his name, and in the second place how he on several occasions demonstrated that pure reasoning, independent of calculation, can also be adapted to the measurement or the comparison of areas and volumes, and presented the most memorable example of this in the memoirs "On maxima and minima," to demonstrate the value of which it suffices to say that the calculus of variations was able to find only a long time after Steiner and by the way opened by him the means to follow synthesis in the solution of such questions.[2]

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[1] As is known, in the works of Steiner there are found innumerable propositions only enunciated; a complete catalogue of the writings devoted to their demonstration would prove extremely useful and is much to be desired.

[2] The original memoirs of Steiner on maxima and minima were completely published only after his death among his complete works; at first fragments of them had been published in the *Journ. f. Math.* and in the *Journ. de Math.* In this line of research Steiner was followed by Lindelöf ("Propriétés générales des polyhèdres qui, sous une étendue superficielle donnée, renferment le plus grand volume," *Math. Ann.*, 2, 1870, or *Petersb. Bull.*, 14, 1870; "Quelques problèmes relatifs à l'éllipse et à l'éllipsoïde," *Nouv. Ann.*, II., 10, 1871), by Berner Bauer ("Ueber Maxima and Minima geometrischer Figuren," *Zeitschr. f. Math.*, 11, 1866), by R. Sturm ("Bemerkungen und Zusätze zu Steiner's Aufsätzen über Maximum und Minimum," *Journ. f. Math.*, 96, 1884; "Würfel und reguläres Tetraeder als Maximum und Minimum," *ibid.*, 97, 1884), by Sturm and Lampe ("Ueber das Minimum des Inhaltes eines Vierecks bei gegebenen Seiten," *ibid.*), by Schwarz ("Beweis des Satzes, dass die Kugel kleinere Oberfläche besitzt als jeder andere Körper gleichen Volumens," *Götting. Nachr.*, 1884), and by E. Kötter ("Ueber diejenigen Polyeder die bei gegebener Gattung und gegebenem Volumen die kleinste Oberfläche besitzen," *Journ. f. Math.*, 110, 1892).

Less exclusive than Steiner was C. G. Von Staudt (1798–1867),[1] who did not completely separate himself from the influence of his great master Gauss and dedicated a part of his own intellectual activity to researches on the theory of numbers. A part, but not the most elevated and decisive, for this was absorbed by the solution of the great problem to treat the geometry of position without introducing any metrical concept; the *Geometrie der Lage* (Nürnberg, 1847), and the *Beiträge*, with which he adorned it in 1856, 1857, and 1860, certify to the complete result of his assiduous and genial efforts to rid of any extraneous element that projective geometry of which a little while before Poncelet and Chasles in France, Steiner and Möbius in Germany had laid the foundations. We cannot in few words delineate the content of these writings which justify for Von Staúdt the enviable epithet of the "Euclid of the nineteenth century"; we shall only mention the new definition of projectivity there given, which contains only what is necessary and sufficient, and those of the conic and of the quadric, which, including also imaginary curves and surfaces, are able to rival the analytical definitions, and like these are susceptible of being extended to curves and surfaces of any order; we shall add that the researches on the imaginary in geometry[2] availed to put to flight the "spectre" which had pursued Steiner in the last years of his life, and to render superfluous the "principle of continuity" which had multiplied the opponents of the doctrine of Poncelet.[3] Other minor works of

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[1] See the study by C. Segre prefixed to *Geometria di posizione di C. G. von Staudt, trad. dal tedesco a curo del Dr. M. Pieri* (Torino, 1888).

[2] Comp. A. Ramorius, "Gli Elementi imaginari nelle Geometria" (*Giorn. di Mat.*, 35, 1897, e 36, 1898).

[3] Among all the investigations of Von Staudt these are undoubtedly the most abstruse; on this account their results spread with more difficulty in the mathematical world; to facilitate their comprehension, efforts were made in various directions by Lüroth (*Math. Annalen*, 8, 1875, and 11, 1877), August (*Programm der Friedrichs-Realschule*, Berlin, 1872), Stolz (*Math. Ann.*, 4, 1871); Henry J. Stephen Smith (*Ann. di Mat.*, II., 3, 1869–1870), H. Wiener (*Rein geometrische Theorie der Darstellung binärer Formen durch Punktgruppen auf den Geraden*, Darmstadt, 1885), Segre (*Torino Mem.*, II., 38, 1886, and *Journ. f. Math.*, 100, 1886) and Servais (*Belgique Mém.*, 49, 1896). To the theory of imaginaries of Von Staudt is allied the "Rechnung mit Würfen," to which Lüroth (*Mem. cited*), Sturm (*Math. Ann.*, 9, 1876), Schröder (*ibid.*, 10, 1876) and G. Kohn (*ibid.*, 46,

Von Staudt contain applications of the aforesaid doctrines, and, demonstrating how he knew duly to appreciate and in a masterly manner to treat metrical questions, make us regret that it was not given him to give to the *Geometrie der Lage* a sister work in the *Geometrie des Masses* which he had projected.[1]

A direction completely different from the investigations of Von Staudt have the publications of Julius Plücker (1801–1868),[2] to whom analytical geometry is indebted for decisive advancements; to him in fact we owe the development of homogeneous and polyhedral[3] coördinates, of the coördinates of the straight in the plane[4] and of the plane in space;[5] to him, omitting for a moment

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1895) have devoted special researches. In this last work is extended the concept of *Würfe* to a group of n elements of a form of I species; such extension is applied in the later work of the same geometer entitled "Die homogenen Coordinaten als Wurfcoordinaten" (*Wien Ber.*, 104, 1895). A theory of imaginary elements different from that of Von Staudt is created by A. Mouchot and expounded in the works: *La réforme Cartésienne étendue aux diverses branches des mathématiques* (Paris, 1876) and *Les nouvelles bases de la géométrie supérieure* (Paris, 1892).

[1] It is by inspiring themselves with the conceptions of Von Staudt, or rather by unfolding them excellently, that Juel (in the dissertation "Bildrag til den imaginaere Linies og den imaginaere Planis Geometri," Kopenhagen, 1885, and in the article "Ueber einige Grundgebilde der projectiven Geometrie," *Acta*, 14, 1889) and Segre (in the interesting group of notes on "Un nuovo campo di ricerche geometriche," inserted in *Torino Atti*, t. 25 and 26, 1890 and 1891) discovered new correspondences and new figures which it is necessary to consider to exhaust completely the projective geometry of the plane (that is with real and complex points). In the same direction Sforza proceeded in writing the "Contributo alla geometria complessa" (*Giorn. di Mat.*, 30, 1892).

[2] See A. Clebsch, "Zum Gedächtniss an Julius Plücker" (*Götting. Abh.*, 15, 1872). Beltrami justly notes to this discourse that "the best eulogy which can be made of Plücker, considered as a geometer, is this, that Clebsch was not able to weave the account of his works, without recounting to a large extent the history of modern analytical geometry" (*Giorn. di Mat.*, 11, 1873, p. 153). Besides numerous memoirs published mostly in the *Journ. f. Math.*, we are indebted to Plücker for five great geometrical works; they are, *Analytisch-geometrische Entwickelungen* (Essen, 1828–1831), *System der analytischen Geometrie* (Berlin, 1835; see the *Anzeige* given of it by Plücker himself in *Journ. f. Math.*, 10, 1833), *Theorie der algebraischen Curven* (Bonn, 1839), *System der Geometrie des Raumes* (Düsseldorf, 1846), and *Neue Geometrie des Raumes* (Leipzig, 1868–1869).

[3] "Ueber ein neues Coordinatensystem" (*Journ. f. Math.*, 5, 1829).

[4] "Ueber eine neue Art, in der analytischen Geometrie Punkte und Curven durch Gleichungen darzustellen" (*ibid.*, 6, 1829).

[5] "Note sur une théorie générale et nouvelle des surfaces courbes" (*ibid.*, 9, 1831).

the geometry of the straight in space of which we shall treat *ex professo* later, we owe finally varied and most important applications of the "method of abridged notation"[1] of which he is one of the creators,[2] and of that of the "enumeration of constants" which, often but not always, he knew how to employ fitly.[3] If we here dispense with enumerating at this moment the new results for which our science is indebted to him, it is that we consider it much more convenient to do it in describing the successive evolution of the individual theories which constitute modern geometry, and to which it is now time for us to turn, having finished the sketch of the intellectual movement which prepared the present epoch. We thus shall see how the great men of whom we just now learned have been followed by a numerous and brilliant cohort of disciples, who, gleaning in the fields plowed by the masters, proved the fecundity of the seed which these had sowed.[4]

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[1] "Ueber ein neues Princip der Geometrie und den Gebrauch unbestimmter Symbole und Coefficienten" (*ibid.*, 5, 1829); "Analytisch-geometrische Aphorismen" (*ibid.*, 10 and 11, 1831); "Ueber Curven dritter Ordnung und analytische Beweisführung" (*ibid.*, 34, 1847).

[2] Of this procedure (invented also by Bobillier) Plücker indicates the most valuable qualities by the following words: "Meine Gleichungsformen sind vollständige Darstellungen graphischer Constructionen, in denen nichts Fremdartiges sich findet; es sind ideale, mit analytischen Symbolen hingezeichnete Figuren." (*Journ. f. Math.*, 34, 1847, p 332.)

[3] No one ignores how dangerous is this artifice, otherwise very fertile (see for this the recent memoir published by Küpper in the *Math. Ann.*, 32, 1888); Plücker, who knew and boasted of its qualities, knew moreover its drawbacks and often succeeded in avoiding them in the manner described by Clebsch in the afore-mentioned Commemoration.

[4] The foregoing *Sketch* may be followed by other extracts from Loria's work, giving the history of modern geometry as above indicated. But the editors are at present unable to promise how much will be offered to their readers.—*Ed. Monist.*

RELIGION IN FRANCE.

INTRODUCTORY.

WHAT forms does the religious sentiment take in the various provinces of France and in the various classes of the French nation? How is this sentiment satisfied by existing positive religions? These are the questions which I propose to answer in the present paper. I make no pretence to settling the matter, and the inquiry of which I shall here give the results will doubtless throw but a pale light on the religious soul of France. To the set answers obtained from my *questionnaires* I shall add the thousand and one little facts of my daily observation and reading, hoping from these sources to arrive at a tolerably exact view of the situation.

If it should be asked in what manner a religion can satisfy the religious sentiment,—that particular state of the soul which involves fear, a sense of the beautiful, phantasy, and the need of knowledge, and which is apparently compounded of all forms of desire,—we shall at once discover that dogmas and beliefs are not alone sufficient. A religion acts, and acts powerfully, through the personal quality of its ministers, through the forms of its observances, through the architecture of its churches, and the character of its ceremonies.

It would be useles to insist on the importance of the monuments and the ceremonies of the Catholic religion; the same flight of faith that gave birth to the cathedrals still inspires respect for it among us. Not one of the least causes of the disfavor with which the Reformation was received in our country was the indiscreet zeal of the Calvinists in demolishing statues and mutilating the portals of the sacred edifices; the genius of the nation felt itself

wounded in its dearest living creations. The absence of all pomp in the reformed religion and the bareness of its places of worship were also a cause of estrangement; the popular soul did not find in the new faith the spectacles which charmed it, the joyfulness of its old festivals, and the wealth of art which had become a common possession even of the suffering and unfortunate multitudes. There is a body of sentiment so deeply rooted in the Latin race that even its most indifferent representative, when contemplating the magnificent monuments of the past, cannot but feel some vestige of the ancient emotions, and his eyes still cling to their solemn grandeurs even when their religious significance would never affect him.

I believe, therefore, that I am justified in saying that the same frame of mind which led our people to oppose the reformation of Calvin still continues to estrange us from it. It must also be acknowledged that Protestantism, even though it offers some satisfaction to the reason and gives wider scope to criticism, is still in many respects inferior to Catholicism. Its artistic infertility alone is sufficient to justify this statement.[1] It was never able to renew in France the miracles of the preceding centuries. Even in the countries where it triumphed, it could only bestow upon the edifices which it occupied that appearance of "devastated churches" which so forcibly impressed French, Italian, and Spanish travellers and reawakened in them, if only for a moment, the Catholic sentiment, as they stood in the presence of that "bare and sombre religion which saddens both the eyes and the heart."[2] Finally, coming as late as it did, it could make no pretension to satisfying the intellect of the cultivated classes. Human reason, already exacting in its demands, clamored for more than Protestantism offered, and strong minds could not find in the new belief the complete enfranchisement for which they longed on leaving the old.

The reformed religion came, therefore, not as an alleviation,

[1] The only exception perhaps is music, and that principally among the followers of Luther. Luther possessed a warmth and feeling for art which Calvin utterly lacked.

[2] Emilio Castelar.

If it did not devote itself to the incessant guidance and unremitting surveillance of souls, it nevertheless placed them under severe constraint. It asked greater intellectual effort from its devotees, but it restricted this effort to its own sphere. It took from the imagination more than it granted to reason; it appeared to sacrifice the Gospel to the Bible, and the inspiration of the Greeks and Romans to that of the Jews. And for this reason it was less suited than Catholicism to the Latin nations and the Latin culture, which had remained semi-pagan, with little liking for theological discussions, more delicate and more full of life, fanatical by passion rather than by faith, and at bottom more indifferent.

It is true, the power of creation which signalised the Middle Ages seems to have been long exhausted. The decline of Christian art began with the Renaissance of ancient letters, and the decline attained its greatest extreme in that age of rationalism *par excellence*, —the eighteenth century. The favor which was later bestowed on Catholic architecture, which had been temporarily decried, and on the arts which were associated with it, was not accompanied by a like return to the mediæval faith. The same zeal was bestowed upon all the work of reconstructing the past; it was the historical passion of the century just passed,—a work of erudition and not of faith.

To-day the debasement of Christian art is only too patent. The religious imagery is wretched, the sacerdotal garb is at times ridiculous, and the liturgy is disgraced by vulgar songs. I have known ecclesiastics who preferred the mediocre structures of to-day to the venerable edifices of the twelfth and thirteenth centuries. the Church of the Trinity to Notre Dame. The genius of Catholicism is no longer fecund, and only partly sustains itself in the magnificent frame-work of its past.

Yet some signs of reformation manifest themselves. Here and there protests arise against the bad taste and the painted fetishes now in vogue; attempts are made to restore the plain chant and the Palestrinian music. A faint renascence is gaining ground in religious art, coincident with a return of zeal, of which we shall speak later on. This movement, insignificant as it is, cannot es-

cape the observation of thinking people. The battle having been lost by them at many different points, though they have not abandoned even these, Catholics appear to have discovered by instinct that their supreme power lies in the revivification of that moral inspiration which has penetrated art and life in so many ways.

I shall not undertake here to examine whether the quality of the French clergy—another factor which contributes to the success of a religion—is better or worse than it was in the preceding centuries. I refer, of course, to the mass of the secular clergy, for it is only too evident that we no longer have among us a Bossuet or a Fénelon. The simple fact that it is recruited from the lower classes of the nation alone suffices to explain why talents, not to speak of virtues, are growing less and less common among them.

To the same cause doubtless is due that restoration of fetishism and low devotion of which we have seen so many instances in the last fifty years. The education which the young abbés enjoy in common is not calculated to change their native aptitudes nor to make one who has taken orders through constraint or indifference the peer of him who has entered the priesthood from zeal or piety.

It is possible that the Protestant clergy, having been chosen from a minority, counts fewer mediocre men than the Catholic clergy,—the parochial clergy at least. Yet, I have reasons for believing that, taking it as a whole, it is not superior; and I cannot discover in the theses presented to the Protestant faculties of theology any convincing proof of a greater liberality of mind.

From careful observation of the different modes of worship current in the Catholic Church, one might be justified in saying that while Protestantism favors individualism in faith, Catholicism favors it in prayer. But individualism in faith presupposes theological discussions for which the Latin race has no taste. It also involves incertitude, which the generality of women cannot endure. They find freedom in the effusions of the heart; whereas the religious man finds it in silent meditation.

As for the unbeliever, he remains as far removed from the one Church as from the other. In some cases he is absolutely ignorant

of both, and we have with us to-day a class of young people which formerly did not exist. Reared in families who do not belong to the Church and withdrawn since childhood from all proselytic influences, these people have neither religious thoughts nor religious habits. Even the contact of ordinary life scarcely affords them a glimpse into the state of the Christian soul, of which they have no understanding. They are not extravagantly irreligious; they have neither religion nor philosophy.

This new generation is distinguished from the preceding by a very significant characteristic. It represents, so to speak, an unknown quantity in our problem. We shall attempt later to determine it.

We may now proceed to verify and extend the conclusions which we have above briefly intimated. It remains for us also to gain a closer insight into the real nature of the religious sentiment, without stopping to define how it depends or can depend upon the general state of sensibility of each individual.

I.

The Christians of France, especially the Catholics, may be divided into four distinct classes.

The first includes the routine devotees, who have no peculiar merit, and whose religion often borders on idolatry or fetishism. The second embraces a different class of believers, the devotees by habit, a more enlightened type, who accept their religion with simplicity and honesty and among whom the religious sentiment gives evidence of the higher aspirations of the human soul. To the third belong believers of the intellectual stripe, who reason out their faith or receive it from some inward light, combative or meditative, according as the trend of their mind leads them toward theology or mysticism. The fourth embraces those who doubt, who have tired of compromising with themselves and their beliefs, and are on the point of separation. With these the decomposition of faith begins and gradually continues to that final stage where a new doctrine takes the place of the ancient faith.

The first of these classes embraces the great mass of Catholics. Its only strength is in its numbers, and we shall see that it does not appreciably change in quality when it runs into unbelief. It happens also that devotees of a higher class may touch this lower stratum in some particular feature and have retained something of its intellectual condition. The old ethnic base from which it draws its sustenance is the same as that whose superstitious practices Cæsar denounced. It appears here and there in all classes of French society.

We have only to look at the crowds that flock to the places of miracles: they are composed of all classes of people. Here, at least, credulity finds its excuse in misery of body or distress of mind. Life is so full of misfortune, man suffers so cruelly both in his own person and in those whom he loves, that it is unbecoming to scoff too rancorously at these weaknesses of the heart and these vain hopes. But what shall we say of the despicability of the cult of St. Anthony of Padua, which has reached so remarkable a climax that the curate of a great parish in Paris refused to receive the image of this Saint into his chapels!

A case has come under my notice, among others, of an educated and well-born man, the son of a disciple of Voltaire, who never shot a hare without promising a coin to this same St. Anthony; he keeps open account with the treasurer of the beatific one, and absolves his indebtedness each month in cash.

And numberless are the devotions of which the poetical and tragical character alone cloaks their paltriness. Such are the vows taken in times of peril, the consecration of infants to the Virgin under the two colors, a sort of first fruits offered to Heaven. The pagan origin of these practices is too well known to be recalled here. Perhaps they are more common in the south of France, which remained more Latin, and through the Latins they may be traced back to the savage populations.

Henri Barth speaks of an African hamlet where the women, believing the camels of their caravans to be sacred beings, crawl under their bellies in order to obtain their favor. Such are the practices at the festival of St. Pancras in a village of the Provence,

where the little children are made to pass under the car carrying the image of the Saint.

I shall not stop to enumerate these practices. Catholicism has accepted and preserved them, not having been able to abolish them so soon from the hearts of the people, where they have dwelt indelibly engraved for many centuries. The people, furthermore, love the charm of them, even though their faith is ordinarily not affected by them. Their religion, reduced to such practices, is nothing more than a body of acts and gestures learned by heart and of formulas mechanically repeated.

II.

Our second class stands on a higher plane than this quasi-idolatrous mass. Nevertheless, certain traits unite the two, for we all, whether believers or unbelievers, ultimately carry within us thousands of vestiges of things long past. We are concerned here with the true Catholics, whose direct testimony appears to me the most instructive.

A gentleman of Anjou, a man of ability and character, calls attention to the delight (and this, let it be noted, expresses the sentiment of many others) which he always experiences and which has grown more intense with years, in "feeling himself borne upon this bark of Peter" which, although assailed often by furious tempests, is bound, through the guidance of its infallible navigator, finally to conduct him into port. "Doubt," he says, "is so sad and so depressing that I pity with all my heart those whose existence it darkens, and I thank God for having spared me and mine this calamity."

Another inhabitant of Anjou not so high in the intellectual scale, who has always been a believer and has grown more so with advancing age, distinguishes the religious sentiments from the human sentiments, on the ground that "the former afford a genuine, sweet, and profound peace"; while the others, on the other hand, "are always mingled with uneasiness and vague impressions, because we know that natural happiness is transitory, and cannot fill completely an insatiable heart." To preserve his faith he has

frequent recourse to the sacraments and cultivates the habit of "humble and fervent" prayer. His object is the possession of eternal life. He feels the need of zealously acting and struggling for the greatest glory of God, "whom we wish to make known and beloved all around us." The teachings of religion lead him "to practicing charity in all the sublimity of the word." He finds in this existence, "deprived of satisfactions and joys in the eyes of the world," a real happiness in this life, as he expects it in the next.

A woman of high character, belonging to the nobility of Anjou, who has passed through much suffering, likewise regards the Catholic religion as "very necessary" to her soul. "The thoughts and the emotions," she writes, "having as their objects virtue, duty, and death, lift the soul and its aspirations into a supernatural world, leaving far below it not only base and wretched thoughts, but also those that are purely human and material." She has never faltered in her religious faith. If she did not firmly believe that her religion was the only true one, she would change it. She prays and practices her religion regularly. "All the acts," she declares, "all the thoughts of a soul profoundly impregnated with the grand truths of religion, should have as their goal the eternal reward of the life to come."

A lady who lives in Paris, the mother of a family and the wife of a wealthy magistrate, shows a more combative humor. She appears to have read much, cites passages from Buisson and from Jaurès, *Les Annales de philosophie chrétienne*, a communication from Canon Pastoret to the Congress of Bourges. Very reserved in her confidences, she is still emphatic and does not analyse her thoughts. She feels religious "in concentration, silence, and meditation, or when some profound emotion,—joy, grief, affection, or admiration,—strikes her soul." "Doubt," she thinks, "produces nothing. I seek the truth; I have faith in it; I make it the basis of my life. Catholicism is the religion that comes most directly from Christ, and it is that which offers the highest ideal of perfection." She says of the Gospel: "The more I ponder it, the more it offers to me all that enlightenment to which the human soul alone can attain." And again, "God placed man in the world to *try* him (that

is, to put him to His tests). Let us be brave and resigned; let us make ourselves useful; let us aid our brethren. The difficulties of the way are slight when God guides us."

Another woman, carefully educated and very tolerant, has been living in Algiers; she has come into contact with all religions, has admired the sincere piety of the Mussulmans, and felt "how a religion is necessary to man in order to aid him to support exile." It is in her hours of suffering that she throws herself into the arms of God, who protects and consoles her. She takes delight in the pomp and ceremony of the Catholic cult, and seeks out the silence and darkness of its chapels, there to offer up her prayers. Her devotion is not painful or exact. It is an intense solace for her to possess the assurance that she will see again those whom she has lost, and that she is also able by prayer to render them some assistance.

A more simple communication, which also comes from an Angevin lady, unmarried, strikes the same note, but with a more delicate accent. She affirms the necessity of a superior being, the need of justice, the need of believing that the beings whom we have loved so much have not been brutally torn from us forever. The distinguished person who here speaks to us feels nearer to God and to religion in grief than in joy. Tribulations, were she without faith, would only find in her "resistance." A believer from infancy, she had some doubts regarding the Church and its commandments between her twentieth and twenty-fifth years; to-day she reposes in the "faith of the charcoal burner," which appears to her "delicious in its abandonment and simplicity." The religious observance that is to her most necessary is reading and the elevation of the soul, the abandonment of self to God "by thought rather than by words." She loves beautiful ceremonies and beautiful sermons; she has a horror of the "petty pieties" that belittle religion. With her religion for God is mingled a "religion of beauty"; she seek for beauty after the manner of Ruskin, passionately, in sentiment, nature, and art. Without these grand religious thoughts, she says with vigor, a woman cannot remain "mistress of herself," after she has lost inevitably the illusions "which

she loves." This is the religion which enables a woman to do her duty as the mother and educator of her children. As for her, since "henceforward there will be a vacancy in that respect" in her life, she gives it to the poor, to the unfortunate, "as much from natural pity," she adds, "as from religion."

Here is the case of two young girls, two unusual characters as I am assured, who have been successful in picturing this state. They did not know each other, but twice hit upon the same expression for rendering their thoughts.

One of them knows herself to be religious from the fact that she has an absolute confidence in "a supernatural power," toward which she turns in prayer "as naturally as a child turns toward its mother." She discovers religious sentiments in her heart "the whole day long," whenever she is in need of aid or comfort, in her hours of delight or sorrow, when she discovers beauty in the moral order, in nature, or in art. Her religious thoughts are characterised by a common tendency to a desire for amelioration. In the Catholic religion she finds precisely the assistance and strength which are lacking to her, the instruction that seems to her the highest to be had, and lastly the promise of a life eternal, filled with peace and light. She founds her faith and constructs her life on the notions of God, soul, and a future world. Her faith is also a source of action, and moves her to fulfil the duties of a young woman, an elder sister, and a friend; it moves her also to awaken the consoling thought of God in the hearts of those who have forgotten him; to awaken it in them who do not know it and "live on earth without light."

The other of these young women likewise declares that she believes in the supernatural, and discovers in herself religious sentiments the "whole day long," when she feels lassitude, when she looks toward "higher things," toward that which is "best" in her, when she discovers beauty, whether of the soul or of objects, for she connects everything with God "who has created all and unceasingly renews all." She distinguishes her religious thoughts by the fact that these thoughts lead her toward the good; and up to this point both our young women use the same language, revealing

thus the strong imprint of the same moral education. The latter, more intellectually inclined if I am not deceived, declares she cannot conceive of morals without religion, that she has need of a "whole, of a system that is imposed." And such is the Catholic system. Her belief in it is so necessary that if she did not think it to be absolutely valid she would "make short shrift of it" and set it aside as an obstacle if the duty which it imposed upon her was at variance with her natural tendencies. She thinks, it is true, she is impelled by her own nature to aid her neighbor, but she recognises her kindly disposition as a gift of God, and is anxious to have it serve the higher ideal which she finds in the Gospel. She wishes she had greater wealth, to do more good for the unfortunate, not only by alms but by direct personal action. It appears to her that here lies the real interest of life.

Another communication rests more upon a characteristic trait. The lady in question, who belongs to a family of high functionaries, thinks she is Catholic from the fact that she is naturally inclined to admit without examination, and to believe without discussion, anything that is taught her by recognised authority. An intense need for peace and unity holds her in an absolute faith which leaves no leeway for her exceedingly timorous and brooding spirit. She inherited from her father, who was not a believer, the habit of introspection, and this natural disposition also made confession the most necessary practice for her. Formerly, before her marriage, she became so excessively devoted to the practice as to alarm her confessor. Her religious life is richest when she feels happy and is delivered from every grave anxiety. Religious thoughts "calm" her, "fortify" her, "illuminate" her. She declares herself "essentially carried to the state of grace."

Let us sum up in a few lines the physiognomy of this interesting group.

To the question seeking to penetrate the nature of the religious sentiment, such as our correspondents could define it by self-questioning, I have received no answer up to the present in which anything else appears save the indication of some very general trait, internal peace, assurance against doubt, the aspiration toward a

higher world, filial piety, and the sentiment of the beautiful. It manifests itself now in happiness and now in misery, according to temperament, some confiding their sorrows to the Divine Master, others their joys, in order that they may be diminished or increased by his participation; for the idea of God is always present in the religious sentiment thus understood, whether it have for its object the divine will or its creation. It appears as a composite state linked even with a state of sensibility in each subject, where are also prominently marked, according to the person and occasion, the signs of fear, love, pity, æsthetic longings, or moral anxiety. The supernatural attracts the soul without merging the latter in it. The aspiration toward the divine does not reach immersion in God, which is the goal of mystical ecstasy. It does not transcend the point of orientation of desires, or of wished-for alleviation.

As for belief, it remains traditional; it is sustained by habit, and represents a sort of harmony of internal forces established by education and heredity. If doubt enters, it never eats to the foundation, but is dissipated with the enthusiasm of youth. The mind is not sufficiently original or vigorous, and life does not offer enough unexpected turns of fortune to justify it in bartering away its certitudes. The need of moral equilibrium shrinks from running the risks of reasoning. The sweetness of belief wins the day over the feeble outbursts of criticism. Reason intervenes only to give strength in its first stages, not to dispute and not to argue or examine exhaustively. The state of belief is not distinct from the emotional state.

The special notions of God, the soul, and a future world are said to be constantly present, and constitute the guides of life. The doctrine of immortality is the dearest to the heart of the woman who has suffered and wept; it would appear that she cannot tear herself from the hope of some day finding her beloved dead, illusory as the hope may be. It would appear, finally, that the religious thoughts of this class of believers impelled them to do good, to devote themselves to benefactions. And they assert this fact with so much conviction that it is necessary to see in it something more than a mere lesson learned, especially as the les-

son is one that has germinated in the rich soil of a "natural disposition." Some even cannot conceive of moral virtue outside of religion; they feel themselves or imagine themselves to be so weak that their passions would control them without this restraint.

I put no special questions regarding the worship of the Virgin and the Saints. It is remarkable that no allusion is made to them in the responses I received; but I desired the answers to be perfectly uninfluenced and took care not to indicate in any way the mode of reply. There is no doubt that many rigorous observances are practised in this group, and a more searching investigation would reveal the forms they take. But piety assumes here, upon the whole, a moderate form; it is not far-fetched, and is able to keep in harmony with the world. We have here the average class of simple and genuine Catholics. These faithful disciples, especially the women among them, do not seek the doubtful hazard of a higher theological instruction or of a thoroughgoing examination of their beliefs; they do not scrutinise the secrets of their hearts; they are docile sheep in the hands of their pastor, and they do not waste in sensual effusions or in reveries disquieting for their faith the forces which the duties of life demand of them.

III.

Our third class is perhaps less heterogeneous, and yet it is difficult to describe; the subjects that compose it revealing a species of dogmatism in which the reason and the heart appear alternately to prevail, to antagonise, and to confound each other. Here belong the majority of the priests, both secular and regular.

It is here that certain restrictions must be placed upon the value of an inquiry such as ours. In the sincerest confidences there always enters, I admit, some elements of deception; each of us unconsciously poses more or less before himself, and we accept as our own the pose that appears to us the most commendable; and the deception to which we lend ourselves denounces the quality which we do not possess, or the ideal toward which we tend. The person which we would have ourselves be thus finally conquers, or perhaps rather betrays, the person which we are.

But while this is unquestionable as regards our moral attitudes, in matters of faith it is different. Not all the persons interrogated feel themselves free to reply, and the subterfuges of those who risk replies are not apparent. But even abstention is instructive, from the manner in which it is justified; and the very trend that the thought takes in its subterfuges is also a precious datum.

A young man who was serving his novitiate with the Jesuits excused himself in the following manner to a relative who had requested him to reply to my *questionnaire*. "The majority of Catholics," he thought, "would refuse" to answer. "Upon the whole," he added, "it does not seem to me that the questions put the religious problem exactly in its right light; they virtually take it for granted that our state of soul implies nothing more than a *sentiment*, whilst it is primarily a conviction of the mind, a faith based on scientific and philosophical reasons, an intellectual doctrine antecedently to being a principle of conduct. Considered from this last point of view, our religion ought to be not the sole nor the most immediate of our reasons for acting, but it should enter and form part of all of them; in fact, in the life of a religious it is the one that most often dominates, though without excluding other reasons, etc."

We have here a characteristic trait of this new group. These people will have a religion which is a body of *knowledge*; they protest against being religious by emotion or by any unreasoned inclination of the mind. A Catholic priest, from whom I have an only too brief reply, "*distrusts*" (and I italicise the word) all the religious acts of his soul "that are expressible only as sentiments, and particularly as emotions." He knows himself to be religious by the fact that he "seeks to make sacrifices," and when "some movement of grace" directs his intelligence or his will toward God.

The word *grace* may appear here contradictory to the rational motives of criticism. It implies a singular mode of action, the value of which is more profoundly understood by the men with whom we have here to do.

The following testimonies came from two students of medicine, two clever young people thoroughly capable of introspection.

One of these young men thinks that "in its vaguest form the religious sentiment is the need of an ideal, of a belief in a world beyond, a feeling of impotence and a desire for power"; that which characterises it, he adds, and this note is here again the same, "is that it brings us near to God." He can conceive no thoughts nor religious emotions from which the idea of God is absent. Artistic emotions, sublime, philosophical thoughts, all grand and beautiful things, envelop the religious sentiment or take from it their mark, "because they are for us the point of departure of an aspiration toward God, because they are the suggestion that causes the soul to go forth from itself, etc."

These states of the religious soul may exist, according to him, without particular belief other than a belief in God and in the existence and immortality of the soul. Religion, furthermore, does not seem to him to be "a mere matter of sentiment," but a "necessity," without which life would be impossible. "As long as reason," he declares, thus emphasising the insufficiency of vague religiosity, "has no base on which to support its faith, as long as conscience has no inviolable rule by which its weaknesses are corrected, the soul will always float in dim twilight racked by uncertainty and doubt." And again, "What a transformation when faith strengthens and moulds the religious sentiment! The soul discovers the goal, the principle of all things. Its yearnings and its loves have found their object."

He attributes the defects of Catholicism to man solely. He finds in his faith "all of the precision of simple, reasonable, and immutable dogmas." His belief is also his motive of conduct. Prayer would appear to him empty were it not the principle of a "renewal" of activity. "To sacrifice everything for those who suffer, to approach sympathetically all miseries, to care for all physical and moral wounds, especially when very repulsive, to live only for the unfortunate, and in order to afford them the solace for which they look and to which they are entitled, to diffuse about one the truth of consolation and love,—such," he declares, "is what the voice of my religious conscience commands me to do."

The second of these young men, born in France of a Flemish

family, strikes a richer and more significant note. It appears that in him the religious sentiment is mingled with his innate disposition, which causes him to believe spontaneously. I discover in him a passionate imagination, an unconquerable aspiration for the Absolute, in which he shall find repose of mind and reasons for life. A peculiar sentimental substratum supports his entire intellectual edifice. As he understands it, a religion "impregnates life rather than inspires it, gives direction rather than adornment to it." He feels himself religious by the subordination of "even his future" thought, and of "even his eventual" life, to the Catholic faith, that is to say, by a conscious act of his own, although the presence of that "entirety" which is faith appears to him quite "impersonal." He admits the existence of Truth; what is more, he lives for it. "The promises of Christ," he says, "are realised in those who believe in Him; they live the life of Christ, which is to say, the Holy Spirit dwells within them."

This bent of mind is still more distinctly revealed by his classification of the methods of knowledge, of which there are two, one appertaining to the positive man and the other to the religious man. Whilst the possession of rational truths is gained singly and laboriously, the "process" by means of which he assimilated Catholicism is directly the opposite; that "cohesion of certainties" which he calls religious is for him a full guarantee of the special character of these certainties. When the Absolute comes to us, and we have recognised it, the truth which it reveals ought to be admitted in the aggregate. He recognises nothing *human* in his religion save his "act of adhesion and of love."

Thus, his belief offers the distinctly marked characteristic of being entire or of not being at all. Religion cannot be the result of human work. Revealed truths would enter necessarily even into a religion compounded of the elements of several others. But such a situation does not appear to him to be acceptable; he does not believe that we can retain the name of religion for a "partial choice of revealed truths." The certainties of religion, as he understands them, form a compact bundle, no part of which can be separated from the rest. These certainties, these "supra-sensible" truths,

needed for their acceptance merely his "yielding to the belief that the Absolute was better informed than we." The Absolute came to him and he received it.

As for discovering the Absolute in the person of Christ, our correspondent confesses that this is more difficult; but, he remarks, if we have once accepted Him as such, we must either take or reject His revelation; it is all or nothing.

He accordingly eliminates all criticism from faith, and at the same time flatters himself upon having discussed "the foundations of that authority" which he believes absolute, with all the faculties of his being, and with the free scrutiny of his conscience. Finding nothing to contradict it in science or in his own moral conscience, he is resolved not to reject one jot or tittle of it. Collectively the acts which constitute his life and which should be severally inspired by his belief, are, he avows, often in conflict with it; but they have not weakened it. One thing only would trouble his faith, and that is if opinions and acts that contravene it "were not followed with remorse."

Every religious state of soul, it appears to him, may be harmonised with some religion, the Reformation having no limits. Every man who wishes to bring his religion and his religious state of soul into accord, will find in Protestantism a free choice between the Christian truths. This is indeed an interesting reply to the question put, as to whether the religion practiced corresponded exactly to the religious state of soul, and we shall see later that the solution indicated for this fervent Catholic is actually followed by others. Nevertheless, for him no other religion is possible but his own: the Absolute could not have revealed itself in two ways.

The distinction which he makes between a philosophical system and a creed is that the former is never spontaneously admitted by us. Thus, he adds, our adhesion to a system of philosophy "never carries with it a change of heart." Thoughts, emotions, sentiments, all are religious in him, for all the forces of his being are subject to the control of faith, and tend only to "diffuse the life of grace." And it is when he believes, wishes, or feels himself performing some "apostolic act" that the religious life appears to

manifest itself in his heart most strongly. His apostleship proves his faith as generation proves life.

He speaks of the "weaknesses he has lived through." He regrets that the notions of God, the soul, and a future world are not present to him as often as he might wish. Still, the habit of meditating upon them gives to his thought a frequently unaccustomed direction. He dreads Hell as "the voluntary hatred and rejection of the love of God." He longs for Paradise "as the superior miracle of the enchantment of relative souls by absolute beauty." To introduce something of sacrifice into his life,—this is the goal, he finally avers, in which all true religion should culminate. Resignation is victory.

The religious sentiment, in fine, as we have found it in this remarkable example, does not appear to derive its sustenance in any marked degree from either fear, love, or art. It answers primarily to a disposition of the mind, the precise relations of which with the physiological tone of the subject it is difficult to discover. The religious life of our subject is centered in a sort of intellectual vision which would terminate rather in proselytic activity than in ecstasy. The apparent trait of mysticism in him is presumably his method of knowledge, an enravishment of the mind by the Absolute, which comes to him, which he recognises, and to which he abandons himself.

It would appear that his faith,—so entirely accepted that the denial of a single one of its articles would annihilate it,—remains for this very reason subject to accident and danger of dissolution; but it is also supported by the same disposition of the intellect and of the whole soul, which makes it what it is. His reason is of itself inclined to receive the miraculous assistance of grace. The remorse, in which he discovers a sort of criterion, is with him only the spontaneous reaction of a moral nature already moulded. Endowed as he is, he would never reach the calm abstention of the skeptic; he would have become a bold metaphysician if Catholicism had not subjected him to her sway, and had not disciplined at a single blow all the energies of his sentiments.

Many Catholics are akin to this type. A certain number of

women would also be grouped in this class under the head of reasoners or mystics. Among some priests, I am not warranted in saying among many, greater freedom of criticism and a more original turn of mind tends to produce a distinctively individual moral situation, where faith argues with itself and is clarified by a species of decantation. The following reply offers a significant example of this.

The ecclesiastic to whom I owe it was born and still is a Catholic. Catholicism, as he understands it, bears the entire legacy of the most distant past and the vital germ of all the civilisation of the future. Jesus was its "restorer and saviour." The Roman Church in his eyes is not Catholicism; Judæo-Alexandrian as to its dogmas and cult and Cæsarian as to its form of government, the Church is only the garment, the external and transitory form of the faith.

This priest knows himself to be religious both by his intellect and by his soul: by his intellect, because his reason transcends the finite and the sensible; by his soul, because his heart, dissatisfied with what here goes forward, hungers for the Absolute and thirsts for the Eternal.

Religious also for him is every thought, every emotion, every manifestation, every work, which binds us to the Infinite, which excites and satisfies in us this need of the divine; religious, "every man of whatever faith or dogmatism" who carries and fosters in himself this aspiration, "and who, confident of his immortality, reveals his belief in love for everything that lives and suffers about him." He sees perfectly that Catholicism "is declining and apparently perishing," in so far as it is the work of man; but he cherishes the conviction that it will assume in the future a new scientific, æsthetic, and social life, and that the gospel of the spirit will ultimately free it from the humiliating tyranny of the letter. Prayer, charity, the idea of the Beyond, the Eucharistic communion properly understood,—these are the four immovable corner-stones on which the future Church will rest: they have been disfigured, but not destroyed.

Men of this type in their higher manifestations are the light

and glory of a church; but it very frequently happens that they steal away in the night and pass to the camp of the enemy. And their flight is due to widely varying causes, more or less active according to the times and the temperament of the individual,—disaffection of the soul, the rebellion of the intellect, shattered ideals, or the source of obedience, whether it comes from the heart or the head.

But here a new chapter opens, the decomposition of belief.

IV.

We have seen faith at its heroic crisis. It holds its own here not without a struggle, and in many men and women who declare themselves to be sincere Catholics there is already marked at this stage a process of dissolution, of which I shall now indicate the principal steps.

The first situation is that of avowed Catholics, who have made a choice among the Church's beliefs and practices. We no longer find in these that steadfastness, that unity of being, which we have described. One can no longer say of such persons that they are—to borrow a phrase from one of the preceding communications—"models of their faith"; they are "reformed" without wishing it and without knowing it, and they do not wish it because they still retain at heart the Catholic soul in spite of the liberty which they allow themselves.

Such is one of our correspondents, a man of the old nobility and of a high order of merit, who knows much and has lived much. From his eighteenth to his fiftieth year he was skeptical. Some doubts, he admits, still subsist in his mind. But all his aspirations "tend toward an absolute faith." He does not rigorously observe his religious duties. His staunch faith in God nevertheless leads him to put credence in one particular doctrine,—that to which the memories of his house and family bind him. He discovers himself to be religious when in the presence of any of the manifestations of worship, and especially, although he is not of a sad turn of mind, "in mortuary ceremonies." His adhesion to the Catholic faith appears to me to be determined by a profound feeling of social

necessity, that is, by extra-religious motives. The notions of God, the soul, and future life occupy, he says, a considerable place in his reflections and intellectual occupations. He combats unceasingly the process of transformation that bids fair to overcome them. Of a combative nature, he feels himself sometimes impelled to take up arms against the attacks of free masonry on Catholicism. He detests "the men who, having in their hands the instruction of the people, aim to win them away from every belief, thus robbing them of their most efficacious weapon in the struggle for an honest life, profitable both to country and humanity."

The following are the curious statements of two women.

The first thinks that religious faith plays a considerable rôle in the inner life of woman. "If she loses," she says, "her naïve and solid faith, if dogma dissolves, on reflection, as sugar does in water, there remains nevertheless a religious instinct, a need of the ideal, a sort of instinctive certainty of a higher moral life, of an intellectual or immortal world which just as surely exists as the physical world." It is an easy thing to deny the immortality of the soul! In each one of us, she says, is a principle which connects us with the unknown God, with the eternal and immortal principle. She is not Protestant "to the letter," but she has taken her refuge in Christ. "His beautiful ethics" has conquered her forever. One of the grand disillusions of her life is her inability to practice it "in spirit and in truth," though it still remains her light and her faith.

The second of these ladies, who has responded more fully than the first, "belongs *de facto*" to the Catholic religion, but her personal tastes and predilections incline her to Protestantism. But one must, she says, be extremely religious to change one's religion, and this is not the case with her. She does not believe she has the religious spirit; she thinks that the happy ones of this world have no need of faith, which is the last resource and consolation of the unfortunate; if she seeks it and desires it without finding it, it is solely "for want of a better." She has not discovered in herself religious sentiments, save "in times of great suffering"; when pain and death have come into her life, she has "felt" the

necessity of believing in some "recompensation" in the other world, in the achievement at some future time of the destiny which we have dreamed of but not found on this earth. Her highest desire would be "to eternalise human love."

A believer to the age of fifteen, she ceased being such on reading Taine, Renan, and certain other authors. She is now twenty-five years old, and rather reverts to her faith, "but by an act of will, and from sentiment, not from reason."

She criticises the Catholic religion for its narrowness and its insufficiency; all she accepts of it is the slight vestige of Christianity which it seems to her is still left, viz., the faith in Jesus Christ. And yet she does not see in Jesus as she does in Shâkyamuni and Mohammed, only the more or less inferior manifestations of the divine thought. It is to God that everything must be traced back and to God that every rational explanation of the world, of suffering, and of life must be referred, "under penalty of death by pain and discouragement."

God and the eternity of the soul,—such are the two goals of her faith: "instinct of eternity imprisoned in a mortal body." For at bottom she has only semi-beliefs and hypotheses, in conformity to which, "lacking a better reality," she lives. It appears to her impossible to believe "without doubting what one believes." The answers of the intellect to the needs of the soul are insufficient. She does not seek to force on other persons the hypotheses that she has chosen. "Religion, faith, and love," she writes, "are individual things and belong solely to the sphere of sentiment, not to that of reason."

Yet her religion is far from being inactive. While her belief dwells within her, the power of action which she derives from it is diffused outwardly. Religious observance in her eyes is action: to do good, to suffer, to submit. Prayer is only "an aid to action, the trigger of the soul." Her religious life is recapitulated in a single phrase: love of others. Contemplation and mysticism in any of their forms seem to her not only an error but a downright fault; she sees in the world only the necessity of acting, of acting rightly, conformably to one's conscience and one's reason.

With this last lady, who appears to us as a sweet suffering soul, the religious life is especially manifested as an expression of human weakness, of a wrecked and shattered love, of a beautiful dream that has faded away. Her deeply rooted belief in the immortality of the soul and in the higher life corresponds to a logical need of moral equilibrium and of compensation, and is also the desire for an affection which shall endure beyond the tomb. Everything bordering on mysticism in the rigorous sense of an immersion of the soul in God or of a blind adhesion to faith is discarded, but not the mysticism of unfettered dreaming or vague aspiration. If the most necessary ideas are conceived as conjectures, the doubt that remains inherent in them suffers them to subsist with undiminished vivacity in those recondite recesses of conscience where reason can gain no foothold.

With this latter lady—as with the former—we have taken a forward step in the direction of the dissolution of belief. We are now passing to a second stage, which numbers of Protestants and Catholics have, in my opinion, reached,—a stage marked by a vague religiosity exhibited according to temperament in either an idealistic or mystical form. This religiosity retains nevertheless some portion of the Christian truths, and reposes on the discipline of its Church, adhering at more than one point to Christianity. But in the case of others we shall see these points of adherence weakening and loosening, until finally they vanish.

The following is the case of a lady belonging to an environment composed of jurists, physicians, and university people, whose education "has been moulded by the spirit of examination and ratiocination." At the adult age she "voluntarily" renounced Catholicism and had her children reared in the faith of "liberal Protestantism." A species of religiosity which she attributes to her conscientious submission to the commandments of the Church made its appearance in her at the time of her first communion; her gradual emancipation caused it to vanish. She does not think that she has now what is called the religious spirit, "unless," she says, "the religious spirit is nothing more than a kind of elevation toward the ideal, produced by artistic emotions, by grand spectacles

of nature, or the lofty meditations of ethics." A special belief is not necessary for her; she follows the teachings of a liberal Protestantism, which corresponds "approximately" to her religious state. She ignores "the narrow side of her creed and the few ingredients of dogma which it contains," clinging solely to its moral teachings, which she finds extremely noble.

She refrains from either denying or accepting the notions of God, the soul, and a future life; these notions, she thinks, pass the powers of human comprehension. Further, she does not deem them indispensable to action. Finally, judging from numerous examples in her own environment, she has concluded that a purely ethical instruction may suffice to form honest, upright, and high-minded beings, "whilst confessional education, pure and simple, is impotent in this regard." Catholicism, further, appears to her to exercise, in education at least, a demoralising influence. She criticises the "political spirit of the clerical party," which has so completely confounded facts, dogmas, and practices that frequently there is nothing left "among the disillusioned followers of Catholicism," of either belief, religious spirit, or morality.

A magistrate, the husband of the lady just cited, also suddenly renounced during adolescence the doctrines of the Roman Church. Later, his thought, "enlightened by observation of the social conduct of Catholics," led him "to repudiate absolutely traditional religion and even to look upon the Catholic spirit as detrimental to genuine devotion and to the following of a satisfactory moral code." He can now only call himself a free-thinker; he "dares to affirm" that he is so without intolerance. He does not believe himself religious; he does not see the least necessity for a particular belief of a dogmatic character, and abides by the conception of a body of moral duties, "or if the expression appear more appropriate, by a body of obligations of conscience toward oneself and others." He does not reject as void of all interest "the problems relating to the existence of a personal God, of an individual immaterial principle surviving the body of each one of us, and called the soul"; but he declares himself powerless to find the solution of them and does not believe that the rules of social conduct are in need of a doctrine

founded on these mysterious questions. He inclines rather "to a sort of pantheism."

To the same class belongs a Parisian lady, wealthy, intelligent, infirm, and blighted in her dearest affection. She abandoned completely the Catholic religion, of which even the ceremonies scarcely impress her, so greatly is she irritated by "their underlying fatuity." She follows no creed, accepts neither revelation nor supernaturalism, and declares herself refractory in metaphysics, although idealistic in spite of this fact. "Gazing on the starry heavens, or on some magnificent spectacle of nature," she writes, "I am profoundly troubled, and I avow that I comprehend with difficulty that intelligent beings can find full satisfaction in artistic admiration only. Before the infinitely small I experience the same ecstasy .... These are the only moments when I can discern in myself a religious sentiment, if I may at all so qualify this emotion." Common sense, she thinks, dictates that in the lack of a religious belief she should abstain from curious inquiries; but, though ignorant of science, she has the "speculative" spirit, and these lofty questions "fascinate her nevertheless."

She is in no need of a particular belief, although she would prefer not "to live in the open air"; in following the good she is at least sure of not being deceived. She feels within herself an ideal of moral beauty and of kindness, in communion with which she loves to live, but which she grieves to see contravened by the brutal laws of nature. Her intellectual peace is troubled by it, even when her conscience is at rest.

Never in the most sorrowful hours of her life has she felt the need of turning toward God, who, even if he existed, would not, she thinks, interest himself in her individuality. Her consolation has always come from her sentiment of duty, from comparison of her own state with that of those more unfortunate than herself, from her resigned submission to the laws of the universe; for she believes that there are laws in the moral order just as there are in the physical. The word *God* corresponds to so gigantic an interrogation point for her that she abhors all cynical and blasphemous spirits of negation. She does not know whether he exists, nor

whether the soul exists; she has the impression that our soul is extinguished with death. These ideas regarding human destiny suffice for the conduct of her life; but she is averse nevertheless to disseminating them, since she thinks them insufficient from a social point of view.

Another lady less favored by fortune and who appears to be very reticent, refuses to explain herself at length. "One can," she writes, "easily confess things to oneself which one would not like to commit to others." Further, it would be somewhat like criticising those who had reared her and also those with whom she associated; again, "since all things hang together" (I draw attention to this passage), "and since the portion of sentiment with which every one is burdened never remains inactive, it would also be necessary to say what use she had made of her portion; and why it tended to direct her to one side rather than to another." She affirms, nevertheless, that she is absolutely lacking in religiosity. "Far from its being a privation to me," she writes with some warmth, "I believe that its consoling feature is the conviction that there is nothing after death, that one has made an end of all suffering. Every one puts his hope where he can; mine asks nothing but oblivion, that is in the other world, for in this I have other pretensions."

A young woman of twenty-six, an Angevin, wealthy, very intellectual, and of good family, gives us in compensation a very extended communication, interesting in all points. She was a believer and Catholic up to her fourteenth year. From the day of her first communion she ceased to be such. "I divined," she writes, "the lies, the crafty machinations, the selfish policy; I fathomed the consciencelessness, the despotism, and especially the slavery, of fervent Catholics." Out of regard for her family, and from a sort of intellectual laziness and a cowardly respect for public opinion, she nevertheless followed the practices of her religion. But she reproached herself for it, and especially she reproached Catholicism for its antagonism of the Gospel, on which it rested, and for not admitting freedom of will and individual control of conscience. For these reasons the Protestant religion was

more to her taste. The latter at least did not enforce such puerile practices and did not put love under the tutelage of the confessor, and "banish beauty."

Such is the dominating note of this character which appears to me to be essentially artistic, lofty, and with a passion for excessive imagination.

The thoughts and the emotions which she would characterise as religious, "or rather as sacred," spring up in her when contemplating some beautiful spectacle of nature, or on hearing some beautiful work of man. "Sometimes," she says, "on the summit of a mountain, in the evening, and in the neighborhood of glaciers, I have had for the moment the conviction that some power, some reason, some higher superhuman beneficence, presided over so much harmony and order; but I have never likened this powerful, intelligent, beneficent, and *divine* being, so vaguely and fugitively conceived, to the God that the modern Catholic Church portrays." When she sees the gloom created about her by the priests, she ardently longs for the "æsthetic morals of the Athenians, their light-hearted gladness, and the humanity of the Greek cults in the fourth century before Christ."

The dominating duty in her eyes is respect for oneself and one's ideals, the employment of one's faculties "in life for life." She "is absolutely in doubt regarding the serious and fundamental questions of future life, eternity, our ultimate destiny, and to what is commonly called our *soul*. None of the solutions proposed satisfy her reason; she thinks that we know nothing, that we are sure of nothing, and that a vast amount of vanity, credulity, stupidity, superficiality, or lunacy, is requisite to assert that either God exists or does not exist, and to draw any conclusions from such a hypothesis."

A very significant communication comes finally, from another young woman, a Parisian and a composer of merit, distinguished in every respect. Reared by non-communicating parents, she belongs to no religion. She boldly declares being unable to accept even the principle of God, that is, "the existence of a supreme Force acting consciously on what we perceive of the universe."

She can see no argument deduced from the beauty, duration, or regularity of our world that affirms this principle. She does not admire the world, "being unable to compare it to anything else but itself." She is unable, therefore, to follow any of the existing religions; being only tentative explanations of the unknown, to her it seems natural that they should change, seeing that they depend, like every hypothesis, on the number and the state of the things known at the time of their formation.

But if she deems herself incompetent to judge the world, nothing prevents her, by way of compensation, she says, from loving it. She loves it, then, "as the fish loves the water, because it cannot live without it." She cannot see that this felicitous harmony which keeps us in accord with things is even a subject for admiration, which is an emotion rather than a judgment. She seeks to reduce everything to the intellectualistic point of view,—the divine principle as well as religion and ethics. But her sentiment resumes its rights, and she describes wonderfully the state of her soul, which is highly remarkable.

Unbelieving as she might at first appear and coldly rationalistic, she yet discovers that the religious sentiment is highly developed in her. Her sympathy extends to those who believe; she understands them and they understand her. There is nothing in their lives of which she does not seize instinctively the most delicate manifestation. "Yes," she declares, "all who have ever believed are my equals, my brothers, whilst nothing is more foreign to me than the incredulous common sense that does not dream. The accents, the expressions, of their faith penetrate me with so profound and genuine an emotion that I have been compelled more than once to give voice to my feelings in music." And an artist "in her language never lies."

"It is odd," she continues, with her refreshing candor, "that my heart can be stirred by what has never troubled my reason, but it is a fact, and I have long fostered without knowing it the contradiction that abides in me."

She partly, though unwittingly, explains this contradiction when she supposes the probable reason of it is that "religions are

the most beautiful and touching creations of man." Or again, when she says that the religious sentiment "resides" in every being who feels that ideas are of life and that "religion must be the imperfect and variable expression of a sentiment which exists before any defined belief, and itself creates its own object."

The fact is that her creative nature protests both against irreligion and against traditional dogmatism, against the barrenness of heart inherent in negation and the curbing of fancy by the letter. She has need of faith and of freedom. The same stroke of the wing that exalts the great religious mystics above the poverty of vulgar religion carries her beyond precisely defined dogmas and narrow observances and causes her to accept no more of religion than the aspiration for the beautiful, which is the divine, and the sincerity of effort to attain it. Her intellectual deficiencies are offset by her spontaneous artistic genius, and we have here a striking example of the resurrection of the religious sentiment by art, a proof of the conciliating truth that all noble creatures are at bottom acting by desire and by living belief.

In our group of dissidents of varying degrees we have hitherto met with the partial rejection or negation of Catholicism without any clearly conceived doctrine being instituted to take its place. The last stage is marked by the deliberate substitution of one belief for another, of a coherent body of ideas and sentiments for ideas and sentiments that have been undermined. This substitution is in some instances effected either by the adoption of a doctrine already formed, like positivism, or by the constant employment of one's forces in the search for some new truth. Examples of this class abound, but one should be careful not to imagine that this is the common practice, or that disintegration of the Christian faith (for Christianity at large is essentially involved here) necessarily carries with it in all cases a distinct advantage. The ruin of traditional ideas is only too often synonymous with a reversion to an inferior state, not only in the ignorant classes, but even in those which possess the polish of a higher culture.

I have unqualifiedly denounced the coarse devotions rampant in the Catholic religion; it has preserved the use of the amulet,

and its belief in miraculous interventions has led to the most puerile practices. But religion alone, I must reiterate, is not involved here; the ancient and vital character of man comes to light in these miseries. A like inferiority is discoverable in many men who have abandoned religion, and we have found at the limit of the dissolution the same ethical and moral situation that stamps its lower grades. We have seen quite recently all manner of people thronging about the doors of ignorant women necromancers, and the less disguised humbuggery of occultism never wants its patrons.

Simple and straightforward souls in whom faith vanishes are more apt to revert to a kind of natural religion. Such is the case of an honest workwoman of the environs of Paris. To the question whether she believed in God, she replied: "He has never had much concern for me in my times of trouble. Why should I concern myself about him?" To the question whether God existed, she answered that she knew nothing of the kind, and she thought with all the other people round about that the real god was the sun which made everything grow. To the other question, whether she expected nothing after death, whether all ended with death, she said: "We are like the plants; they spring up and they die, and then new ones spring up." She had no time to go to church, but she would not be averse to spending an hour there on Sunday, for it was "a tidy place" where one could rest and hear good songs and music. More people than we are aware of in our agricultural districts in France have reverted to this childish paganism. The situation is, relatively speaking, favorable, since there comes to light in it at least a need of poetry and a desire for something higher. But how many people fall to a still lower state, to the lowest level of the animal! They have lost utterly the little decency which religion, despite all, infuses into life at some hours. They seek for nothing else in this world but enjoyment and the indulgence of their lusts.

V.

The idolatrous mass which composed our first group are not followers of French Protestantism, which is the result of a selec-

tion. The Reformation could not reach this stagnating residuum of the population, these ethnical offscourings massed together in certain remote corners of our provinces, whose superstitions the Catholic priests have purified and sometimes utilised when unable to eradicate them. The very rejection of a constant and miraculous divine intervention in the pettiest affairs of life carries with it among Protestants important consequences in belief and religious observances. Perhaps we are constrained to see here a really fundamental difference; and the acceptance of miracles, however limited, nevertheless stamps with a definite mark Catholics of the higher order, akin as they may be otherwise to Protestant Christians of the same class.

We should doubtless have discovered signs of decomposition, or rather, of the transformation of belief in certain Catholic priests who have remained nevertheless good Catholics,—could we have obtained their confidences. Similar indications distinctly appear in some Protestants. M. W. Monod[1] has recently told us of the doubts which the orthodox theology of Calvinism inspired in Vinet. Not only would Vinet not admit the plenary inspiration of the Scriptures, and not only did he regard the Bible as a collection of human writings, but he was troubled throughout his whole life by the difficulties which the dogma of redemption offered to his mind; he could not conceive of the idea of substitution which served as the basis of this dogma and which appeared to him contradicted by our moral notions.

M. Auguste Sabatier[2] was seized with similar doubts. He discarded both the primitive theological notion of a ransom paid by God to Satan and the consequent juridical conception of an objective satisfaction rendered to God under the form of a debt paid to a creditor or of a substitutive penalty agreed on by the judge; he sees in the drama of Calvary only the most sublime example among many others of the devotion of love,—condition of salvation and of new life in the moral world.

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[1] *Vinet douteur* (Paris, Fischbacher).

[2] *Études de théologie et d'histoire* (Paris, Fischbacher).

Our correspondents, as we have seen, do not enter into these discussions. The dissolution of belief is effected, among the greatest number of them, by the way of vague reasoning. When doubt has forced a French Catholic out of the church, he only rarely takes refuge in Protestantism, and, if at all, only for a short time; usually he overleaps it also with the same bound, and this is one of the reasons why we cannot believe in the success of Protestantism in France, at least in the form in which we see it to-day.

As to the Jews, my personal observations on their religious mentality has been confirmed in various ways. A lady who kindly volunteered to obtain responses to my *questionnaire* writes: "I have not been successful with the most intelligent Jews, who have confessed to me that they no longer believe in their religion, but do not care to say anything derogatory of it; this is a general sentiment in Israel."

These reservations being made, let us attempt to draw some conclusions from the psychological data presented, directing our attention chiefly to the three questions of religious sentiment, faith or religious conviction, and the notions of "God" and "soul."

It would be too hazardous to affirm that the religious sentiment is weakening or for that matter that it was preserving its full vitality in society. The external observation of a cult does not necessarily imply a vigorous piety, and piety also may be met with apart from any definite religious practice. I am at least inclined to think that the diseased form of religious sentiment which finds expression in asceticism with its extreme consequences now appears less frequently. Thus, there is most likely being effected in the heart of Catholicism a transformation which has already begun in Protestantism.

Honor is paid to Luther for having dissipated the chimera of an angelic life superior to the ordinary life of men, and for having shown that piety dwells in the accomplishment of the humblest duties, social life being of greater value than solitude, marriage than celibacy, the full development of our faculties than their repression. And this was "the most absolute contradiction of every-

thing that the Church had lived, believed, and practised up to this time.[1]

Protestantism profited thus by the natural progress which granted to new societies a less troubled and more solidly established existence, but this influence also made itself felt in the moral life of Catholicism. The opposition became still more pronounced between the two currents which have always carried its advancement, and the celebrated quarrel in which Bossuet arose against Fénelon contributed to the triumph of the piety that set its foundation in reason and action.

To every effort to establish a religion based on an intellectualistic psychology, there corresponds, it is true, a reaction. We see it to-day take the form of a vague religiosity and a delicate mysticism culminating in a sort of neo-Christianity fostered by a sickly and impassioned sensibility. This sensibility, furthermore, does not find its sole expression in the form of religious mysticism; it extends over all of life, and we see in it a disposition inherent in human nature which produces certain manifestations of saintliness, as it has produced others in politics, art, and philosophy.

We must distinguish, therefore, between what is healthy and durable and what is sickly and perishable; and in my opinion it is the healthy form of religious sentiment that tends to prevail, although it is impossible to say at present to what end the existing crisis in belief is to lead, or what power of reality the religious sentiment is to have in the absence of a positive faith and of every poetical myth, especially when bereft of that communion of the soul with God which appears after all to be its ground and necessary sustenance.

Are not the great artists of religion, and often too the great toilers in practical religious life, virtual mystics? They strive to curb their natural inclinations, to abandon themselves to the divine will, and to unite their soul with God, using to this end the forces which other men expend on the ordinary labors and enjoyments of life. Whatever passions human beings possess they consume in

[1] Félix Kuhn, *Le christianisme de Luther* (Paris, Fischbacher).

the accomplishment of their moral ideals, we know not at the price of what inward struggles and physical tribulations.

But is it not true that religion loses its color and warmth when we pass from sentiment to intellect, from the heart to the brain? History and observation prove it. It is not, therefore, indifferent to the success of a religion,—this waning of the mystical disposition, or rather this diversion, notably for the benefit of art, of that strange energy springing from the sources of our being which the goal of saintship or proselytism formerly claimed entire.

Further, the decline of mysticism goes hand in hand with the ruin of the mystical method of knowledge. Scientific discipline is gradually gaining the upper hand, being demanded by conditions of work in modern societies. The possibility is now less easily conceived of two methods of knowledge, of which one consists in the mysterious operation of grace, or more simply in deductions *a priori*. A process of intuition and pure logic can scarcely be imagined which should give results acceptable in the face of the facts of positive and objective experience; and this question pushed to its limits is perhaps the critical case of metaphysics, if not also of philosophy. But let us take care not to decide this grave question; the religious fact, intuition is a fact, a valid and undeniable experience.

Ordinary believers, it is true, are not burdened with grave anxieties of this sort; their convictions, born of habit and tranquil apathy, do not appear to me to have either gained or lost in power. Their belief remains what it has always been, a body of vague ideas in which the notions of God and soul alone assume prominence; although even these do not often or efficaciously influence their conduct.

The dearest of all to the hearts of women is the belief in immortality, and it is this same hope of a future life that gains for spiritism so many followers. Among philosophers themselves it is known that some have gone so far as to retain the doctrine of personal survival whilst abandoning or diminishing the importance of the idea of God. But in this last respect I am struck with the great difference of the situation between the French Catholic and

the American Protestant, such as Professor Leuba has portrayed the latter in his inquiry.[1]

A striking change is indicated by him in the affective relations of man to the divinity. "Freedom and equality," he says, "are in modern society the key-note of the relation of the individual to his fellow-men; it seems to be becoming also the key-note of his relations to God. The feeling of freedom towards God has largely supplanted the duty-motive which the Catechisms continue to inculcate: action in obedience to God's command is out of fashion; it is what is right and what is best which is now the favorite reason for conduct. Even a certain feeling of equality, monstrous as this may seem, has passed into the attitude of the people to God: awe, reverence, worship, appear only dimly and not as frequently as is assumed, in the religious consciousness of the democratic Anglo-Saxon."

The case is certainly different with the French Catholic. He hopes for nothing from God save by submission, and he never seeks to force the divine assistance save by prayer. A "sentiment of impotence" which has doubtless also its dignity causes him to bend his knee and holds him in the hands of his Master, who is his stay and his compassion.

Among many persons who have remained believers, we have noticed an entire abandonment of religious practices. The usual cause of their disaffection is the weak personality of certain preachers or monks, sometimes also the attitude of the clergy and their political machinations. I know many pious persons, and even clergymen, who are foremost in denouncing the puerile devotions, greed, commercialism, and misconduct so frequently laid to the charge of the clergy; and we have here one of the main reasons of the hostility that turns from the attack of the unworthy or incompetent servitors of religion to the attack of religion itself. The severity of the public judgment is guaged by the importance of the rôle played, and the gravity of the deception is measured by the object of the calling.

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[1] See *The Monist*, July, 1901.

As to the moral effects of religious teaching, the reader will doubtless have made the observation in reading so many pages filled with good intentions that life would be incomparably better and ethics higher in religious circles if the acts conformed at all closely to the intentions; but this is not the case, and many of our believers are subject to illusions on this point. The idea which they have of good conduct, even when they do not realise it fully, may nevertheless restrain them from falling to a lower level. Several, we have seen, have the feeling that their passions would overpower them if they were not checked by their belief. They undoubtedly slander themselves and are seeking for an argument in favor of an ethics founded on their religion; but their confession is sincere in many cases, and the moralists who deny to religious education so powerful an influence for good, ought at least to accord to it the merit of preventing some evil.

To sum up, what we ordinarily find is the constancy of faith received in childhood, and the return to that faith when shattered for a time or neglected in the course of life.

Among so many examples, I may be permitted to cite that of a master of narration who recently died.[1] His end forms a strange contrast with the spirit of a Parisian journalist, skeptic, and scoffer. When he felt his end approaching, he returned to the religious faith and practices of his early years; every night he repeated his prayers before the curate of his parish, whom he had summoned. One of his old comrades[2] having come to visit him, he said: "Old fellow, I thank you for having come; I press your hand for the last time." And when his friend sought to comfort him, he continued: "Do not seek to deceive me. *My sacrifice has been made.*" Words profoundly Christian and Catholic, remarked his friend to me,—"words which I heard pronounced by my mother and my father on their death-bed. How they impressed me coming from his mouth, me who have known him for thirty years!"

We have here a man reared in the Catholic faith. This man

[1] Aurelian Scholl.

[2] M. le Marquis de Charnacé, who told me the story of this last visit and has permitted me to use his name here.

left his native province, entered the paths of journalism, and became a hero of the boulevard. He wrote of everything, but probed no question to the bottom. Everything religious remained indifferent to him as long as he enjoyed his youth and his health and could indulge in unlimited hopes. The fatal hour sounded at last; then the memories of his childhood and of forgotten sentiments came to life again. The metaphysical animal, always concealed deep within every one of us, awakened in him; the dream of his artificial life was dissipated; the two ends of his existence met, over and above the futile agitation that had filled it.

Things are different with the man who has lived a life of serious thought and ripe deliberation, or with one who has not received a religious education in childhood. Such a one, Littré for example, may in his last hours make a concession to his family but not be *converted* in the real meaning of the term. What we do not find, or very seldom find, is the return to Catholicism of a mind which has been long emancipated, or the conversion of a non-believer.

The same remark applies to Protestantism, and we may see in these facts an indication for the future. Statistics do not inform us regarding the process of the dissolution of belief, of which we have gathered such striking testimonies; let us be on our guard, therefore, against supposing that this process has not its limit or its offset, and to conclude without further reflection that its effects are always beneficial.

We have seen that there exists with us, as with all nations, a mass of men and women having superstitions without true faith and observing the rules of their creeds without participation of the heart, a mass docile to all influences and ready to fall to the lowest plane the moment they are not supported by habit and by the commandments imposed upon them. It would be as dangerous to withdraw from this class their support as it would be foolhardy to affect disdain for the ancient beliefs which satisfied so many lofty and noble souls.

That which ought to perish will perish. Time will always accomplish the ruin which our hand is so eager to inaugurate. Violence never leads to success in the battle of religious ideas; liberty

of conscience is a better guarantee of peace than force, and individuals always know how to find ingenious compromises when a partisan law would embroil everything.

It is not without dismay that I hear philosophers condemning the despotism of morals and of the family and proclaiming the ruin of the ideas in which so many find repose; or authors and playwriters presenting to their public personalities bereft of every notion of duty and of every serious character in life. Instead of such a state of mind representing the expansion and liberation of the individual, I fear it marks its deterioration and servitude. I see what is sought to be eradicated from the modern soul, but I do not see what can be added to it for its enrichment. Everything that hitherto constituted the grandeur of man,—sacrifice, devotion, and heroism,—is supposed to serve no purpose. The sentiments that we prized so highly,—filial piety, respect, virtue, and patriotism,—are declared to be illusory and perishable. We imagine abrogated at a blow and by a miracle of evolution the soul which evolution itself has created. We transport ourselves bodily to an age in the future in which all things of to-day—institutions and even persons—shall no longer be what they now are, in which everything shall be changed,—thoughts and habits, passions and desires. We suffer ourselves to be enravished by the mirage of an approaching age of gold, just as blind and uncritical as the ideologues and verbose poets of the centuries past. We are again reconstructing on paper the world and life, with never a thought for present living humanity.

I do not wish to say that there is nothing sound and acceptable in the criticisms and ambitions of philosophers. The world is involved in continual change. The true meaning of the modifications that are going forward must be apprehended so that we may lend to them the right assistance. It is an ancient proverb that we destroy only what we replace. It is no longer the right of any one to control by his individual action the movement of ideas and facts. The task of comprehending them is in itself difficult enough, and each one of us may find in this field subject for ample reflection.

PARIS. LUCIEN ARRÉAT.

THE PHILOSOPHICAL FOUNDATIONS OF MATHEMATICS.

I. HISTORICAL INTRODUCTION.

MATHEMATICS as commonly taught in our schools is based upon axioms. These axioms so called are a few simple formulas which the beginner must take on trust.

Axioms are defined to be self-evident propositions, and are claimed to be neither demonstrable nor in need of a demonstration. They are statements which are said to command the assent of every one who comprehends their meaning.

Euclid does not use the term "axiom." He starts with Definitions (ὅροι), which describe the meanings of point, line, surface, plane, angle, etc. He then proposes Postulates (αἰτήματα) in which he takes for granted that we can draw straight lines from any point to any other point, and that we can prolong any straight line in a straight direction. Finally, he adds what he calls Common Notions (κοιναὶ ἔννοιαι) which declare that things which are equal to the same thing are equal to one another; that if equals be added to equals, the wholes are equal, etc.

I need not mention here that the readings of the several manuscripts vary, and that some propositions (e. g., that all right angles are equal to one another) are now missing, now counted among the postulates, and now adduced as common notions.

In our modern editions of Euclid we find a statement concerning parallel lines added either to the Postulates or Common Notions. Originally it appeared in Proposition 29 where it is needed to prop up the argument that proves the equality of alternate angles on parallels, viz., that—

"those straight lines which, with another straight line falling upon them, make the interior angles on the same side less than two right angles, do meet if continually produced."

This is exactly the point to be proved, for it is only one form of the conception of parallelism. So it was formulated axiomatically as follows:

"If a straight line meet two straight lines, so as to make the two interior angles on the same side of it taken together less than two right angles, these straight lines being continually produced, shall at length meet upon that side on which are the angles which are less than two right angles."

This dogmatic statement (now commonly called "the axiom of parallels") was naturally transferred by the editors of Euclid to the introductory portion of the book where it now appears either as the fifth Postulate or the eleventh, twelfth, or thirteenth Common Notion. The latter is obviously the less appropriate place, for the idea of parallelism is assuredly not a Common Notion; it is not a rule of pure reason such as would be an essential condition of all thinking, reasoning, or logical argument. And if we do not give it a place of its own, it should either be classed among the postulates, or recast so as to become a pure definition.

It seems to me that no one can read the axiom of parallels as it stands in Euclid without receiving the impression that the statement was affixed by a later redactor. Even in Proposition 29, the original place of its insertion, it comes in as an afterthought; and if Euclid himself had considered the difficulty of the parallel axiom, so called, he would have placed it among the postulates in the first edition of his book, or formulated it as a definition.[1]

Though the axiom of parallels must be an interpolation, it is of classical origin, for it was known even to Proclus (410–485 A. D.), the oldest commentator of Euclid.

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[1] For Professor Halsted's ingenious interpretation of the origin of the parallel theorem see *The Monist*, Vol. IV., No. 4, p. 487. He believes that Euclid anticipated metageometry, but it is not probable that the man who wrote the argument in Proposition 29 had the fifth Postulate before him. He would have referred to it or stated it at least approximately in the same words. But the argument in Proposition 29 differs considerably from the parallel axiom itself.

By the irony of fate, the theory of the parallel axiom, the authorship of which is extremely doubtful, has become more closely associated with Euclid's name than anything he has actually written, and when we now speak of Euclidean geometry we mean a system based upon this conception of parallelism.

The word axiom (ἀξίωμα) means "honor, reputation, high rank, authority," and is used by Aristotle, almost in the modern sense of the term, as "a self-evident highest principle," or "a truth so obvious as to be in no need of proof." It is connected with the verb ἀξιοῦν, "to deem worthy, to think fit, to maintain," and with ἄξιος, "worth" or "worthy."

The commentators of Euclid who did not understand the difference between Postulates and Common Notions, spoke of both as axioms, and even to-day the term Common Notion is mostly so translated.

We may state here at once that all the attempts made to derive the axiom of parallels from pure reason were necessarily futile, for no one can prove the absolute straightness of lines, or the evenness of space, by logical argument. Therefore these concepts, including the theory concerning parallels, cannot be derived from pure reason; they are not Common Notions and possess a character of their own. But the statement seemed thus to hang in the air, and there appeared the possibility of a geometry, and even of several geometries, in whose domains the parallel axiom would not hold good. This large field has been called metageometry, hypergeometry, or pangeometry, and may be regarded as due to a generalisation of the space-conception involving what might be called a metaphysics of mathematics.

Mathematics is a most conservative science. Its system is so rigid and all the details of geometrical demonstration are so complete, that the science was commonly regarded as a model of perfection. Thus the philosophy of mathematics remained undeveloped almost two thousand years. Not that there were not great mathematicians, giants of thought, men like the Bernouillis, Leibnitz and Newton, Euler, and others, worthy to be named in one breath with Archimedes, Pythagoras, and Euclid, but they ab-

stained from entering into philosophical speculations, and the very idea of a pangeometry remained foreign to them. They may privately have reflected on the subject, but they did not give utterance to their thoughts, at least they left no records of them to posterity.

It would be wrong, however, to assume that the mathematicians of former ages were not conscious of the difficulty. They always felt that there was a flaw in the Euclidean foundation of geometry, but they were satisfied to supply any need of basic principles in the shape of axioms, and it has become quite customary (I might almost say orthodox) to say that mathematics is based upon axioms. In fact, people enjoyed the idea that mathematics, the most lucid of all the sciences, was at bottom as mysterious as the most mystical dogmas of religious faith.

Metageometry has occupied a peculiar position among mathematicians as well as with the public at large. The mystic hailed the idea of n-dimensional spaces of curvature and other concepts of which we can form definite concepts but can have no concrete representations. They promised to justify all his speculations and give ample room for innumerable notions that otherwise would be doomed to irrationality. In a word, metageometry has always proved attractive to erratic minds. Among the professional mathematicians, however, those who were averse to philosophical speculation looked upon it with deep distrust, and therefore either avoided it altogether or rewarded its labors with bitter sarcasm. Prominent mathematicians did not dare to risk their reputation, and consequently many valuable thoughts must have remained unpublished. Even Gauss did not dare to speak out boldly, but communicated his thoughts to his most intimate friends under the seal of secrecy, not unlike a religious teacher who fears the odor of heresy. He did not mean to suppress his thoughts but he wanted to bring them before the public only in their mature shape. A letter to Taurinus concludes with the remark:

"Of a man who has proved himself a thinking mathematician, I fear not that he will misunderstand what I say, but under all circumstances you have to regard it merely as a private communication of which in no wise public use, or one that

might lead to it, is to be made. Perhaps I shall publish them myself in the future if I should gain more leisure than my circumstances at present permit."

C. F. GAUSS.

GÖTTINGEN, 8. November, 1824.

The first attempt at dispensing with the problem of parallelisms was made by Nasir Eddin (1201–1274) whose work on Euclid was printed in Arabic in 1594 in Rome. His labors were taken up by John Wallis who in 1651 communicated Nasir Eddin's expositions of the fifth Postulate in a Latin translation to the mathematicians of the University of Oxford, and then propounded his own views in a lecture delivered on July 11, 1663. Nasir Eddin takes his stand upon the postulate that two straight lines which cut a third straight line, the one at right angles, the other at some other angle, will converge on the side where the angle is acute and diverge where it is obtuse. John Wallis, in his endeavor to prove this postulate, starts with the auxiliary theorem:

> If a limited straight line which lies upon an unlimited straight line be prolonged in a straight direction, its prolongation will fall upon the unlimited straight line.

There is no need of entering into the details of his proof. We may call his method the proposition of the straight line and will grant him that he proves the straightness of the straight line. In his further argument John Wallis shows the close connection of the problem of parallels with the notion of similitude. If we grant the one we must accept the other, and thus in Euclidean geometry the theorem holds good, for of any figure we can construct similar figures of any size.

Girolamo Saccheri, a learned Jesuit of the seventeenth century,[1] attacked the problem in a new way. He saw the close connection of parallelism with the right angle, and in his work on Eu-

[1] Born Sept. 5, 1667, in San Remo. He became a member of the Jesuit order March 24, 1685, and served as a teacher of grammar at the Jesuit College di Brera, in Milan, his mathematical colleague being Tommaso Ceva (a brother of the more famous Giovanni Ceva). Later on he became Professor of Philosophy and Polemic Theology at Turin and in 1697 at Pavia. He died in the College di Brera Oct. 25, 1733.

clid[1] proposed three possibilities. If in the quadrilateral figure $ABCD$ the sides $AB = CD$ and the angles in A and B are right angles, the angles at C and D may be acute or obtuse. He undertakes to prove the absurdity of these assumptions so as to leave the only solution the sole possibility left, viz., that they must be right angles. But he finds difficulty in pointing out the contradiction to which these assumptions may lead and thus he opens a path on which Lobatchevsky (1793–1856) and Bolyai (1802–1860) followed, reaching a new view which makes three geometries possible, viz., the geometries of (1) the acute angle, (2) the obtuse angle, and (3) the right angle, the latter being the Euclidean geometry, in which the theorem of parallels holds.

While Saccheri seeks the difficulty of the problem in the notion of the right angle in the special case of a quadrangle, the German mathematician Lambert[2] starts from the notion of the sum of the angles of a triangle being equal to 180 degrees. There are three possibilities: the sum may be exactly equal to, more than, or less than 180 degrees. The first will make the triangle a figure in a plane, the second renders it spherical, and the third produces a geometry on the surface of an imaginary sphere. As to the last hypothesis Lambert said not without humor:[3]

"This result[4] possesses something attractive which easily suggests the wish that the third hypothesis might be true."

He then adds:[5]

"But I do not wish it in spite of these advantages, because there would be innumerable other inconveniencies. The trigonometrical tables would become in-

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[1] *Euclides ab omni naevo vindicatus; sive conatus geometricus quo stabiliuntur prima ipsa universae geometriae principia.* Auctore Hieronymo Saccherio Societatis Jesu. Mediolani, 1773.

[2] Johann Heinrich Lambert was born August 26, 1728, in Mühlhausen, a city which at that time was a part of Switzerland. He died in 1777. His *Theory of the Parallel Lines*, written in 1766, was not published till 1786, nine years after his death, by Bernoulli and Hindenburg in the *Magazin für die reine und angewandte Mathematik.*

[3] P. 351, last line in the *Mag. für die reine und angewandte Math.*, 1786.

[4] That if in the square $ABCD$, the angle in G were less than 90 degrees (Lambert says 80 degrees), the side AB would be equal to AD.

[5] *Ibid.*, p. 352.

finitely more complicated and the similitude as well as proportionality of figures would cease altogether. No figure could be represented except in its own absolute size; and astronomy would be in a bad plight, etc."

Lobatchevsky's geometry is an elaboration of Lambert's third hypothesis and it has been called "imaginary geometry" because its trigonometric formulas are those of the spherical triangle if its sides are imaginary, or, as Wolfgang Bolyai has shown, if the radius of the sphere is assumed to be imaginary $=\sqrt{-1}$.

Lambert lays much stress on the proposition that each of the three hypotheses must be regarded as valid if only one case of it be found to be valid.

France has contributed least to the literature on the subject. Augustus de Morgan records the following story concerning the efforts of her greatest mathematician to solve the Euclidean problem. Lagrange, he says, composed at the close of his life a discourse on parallel lines. He began to read it in the Academy but suddenly stopped short and said: "Il faut que j'y songe encore." With these words he pocketed his papers and never recurred to the subject.

Legendre's treatment of the subject appears in the third edition of his elements of Euclid, but he omitted it from later editions as too difficult for beginners. Like Lambert he takes his stand upon the notion of the sum of the angles of a triangle, and like Wallis he relies upon the idea of similitude, saying that "the length of the units of measurement is indifferent for proving the theorems in question."[1]

A new epoch begins with Gauss, or rather with his ingenious disciple Riemann. While Gauss was rather timid about speaking openly on the subject, he did not wish his ideas to be lost to posterity. In a letter to Schumacher, dated May 17, 1831, he said:

"I have begun to jot down something of my own meditations, which are partly older than forty years, but which I have never written out, being obliged therefore to excogitate many things three or four times over. I do not wish them to pass away with me."

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[1] *Mémoires de l'Académie des Sciences de l'Institut de France.* Vol. XII. 1833.

The notes to which Gauss here refers have not been found among his posthumous papers, and it therefore seems probable that they are lost and our knowledge of his thoughts remains limited to the comments that are scattered through his correspondence with mathematical friends.

Gauss wrote Bessel (1784–1846) January 27, 1829:

"I have also in my leisure hours frequently reflected upon another problem, now of nearly forty years' standing. I refer to the foundations of geometry. I do not know whether I have ever mentioned to you my views on this matter. My meditations here also have taken more definite shape, and my conviction that we cannot thoroughly demonstrate geometry *a priori* is, if possible, more strongly confirmed than ever. But it will take a long time for me to bring myself to the point of working out and making public my *very extensive* investigations on this subject, and possibly this will not be done during my life, inasmuch as I stand in dread of the clamors of the Bœotians, which would be certain to arise, if I should ever give *full* expression to my views. It is curious that *in addition to* the celebrated flaw in Euclid's Geometry, which mathematicians have hitherto endeavored in vain to patch and never will succeed, there is still another blotch in its fabric to which, so far as I know, attention has never yet been called and which it will by no means be easy, if at all possible, to remove. This is the definition of a plane as a surface in which a straight line joining *any two* points lies *wholly* in that plane. This definition contains *more* than is requisite to the determination of a surface, and tacitly involves a theorem which is in need of prior proof."

Bessel in his answer to Gauss makes a distinction between Euclidean geometry as practical and metageometry (the one that does not depend upon the theorem of parallel lines) as true geometry. He writes under the date of February 10, 1829:

"I should regard it as a great misfortune if you were to allow yourself to be deterred by the 'clamors of the Bœotians' from explaining your views of geometry. From what Lambert has said and Schweikardt orally communicated, it has become clear to me that our geometry is incomplete and stands in need of a correction which is hypothetical and which vanishes when the sum of the angles of a plane triangle is equal to 180°. This would be the *true* geometry and the Euclidean the *practical*, at least for figures on the earth."

In another letter to Bessel, April 9, 1830, Gauss sums up his views as follows:

"The ease with which you have assimilated my notions of geometry has been a source of genuine delight to me, especially as so few possess a natural bent for

them. I am profoundly convinced that the theory of space occupies an entirely different position with regard to our knowledge *a priori* from that of the theory of numbers (*Grössenlehre*); that perfect conviction of the necessity and therefore the absolute truth which is characteristic of the latter is totally wanting to our knowledge of the former. We must confess in all humility that a number is *solely* a product of our mind. Space, on the other hand, possesses also a reality outside of our mind, the laws of which we cannot fully prescribe *a priori*."

Another letter of Gauss may be quoted here in full. It is a reply to Taurinus and contains an appreciation of his essay on the Parallel Lines. Gauss writes from Göttingen, Nov. 8, 1824:

"Your esteemed communication of October 30th, with the accompanying little essay, I have read with considerable pleasure, the more so as I usually find no trace whatever of real geometrical talent in the majority of the people who offer new contributions to the so-called theory of parallel lines.

"With regard to your effort, I have nothing (or not much) more to say, except that it is incomplete. Your presentation of the demonstration that the sum of the three angles of a plane triangle cannot be greater than 180°, does indeed leave something to be desired in point of geometrical precision. But this could be supplied, and there is no doubt that the impossibility in question admits of the most rigorous demonstration. But the case is quite different with the second part, viz., that the sum of the angles cannot be smaller than 180°; this is the real difficulty, the rock on which all endeavors are wrecked. I surmise that you have not employed yourself long with this subject. I have pondered it for more than thirty years, and I do not believe that anyone could have concerned himself more exhaustively with this second part than I, although I have not published anything on this subject. The assumption that the sum of the three angles is smaller than 180° leads to a new geometry entirely different from our Euclidean,—a geometry which is throughout consistent with itself, and which I have elaborated in a manner entirely satisfactory to myself, so that I can solve every problem in it with the exception of the determining of a constant, which is not *a priori* obtainable. The larger this constant is taken, the nearer we approach the Euclidean geometry, and an infinitely large value will make the two coincident. The propositions of this geometry appear partly paradoxical and absurd to the uninitiated, but on closer and calmer consideration it will be found that they contain in them absolutely nothing that is impossible. Thus, the three angles of a triangle, for example, can be made as small as we will, provided the sides can be taken large enough; whilst the area of a triangle, however great the sides may be taken, can never exceed a definite limit, nay, can never once reach it. All my endeavors to discover contradictions or inconsistencies in this non-Euclidean geometry have been in vain, and the only thing in it that conflicts with our reason is the fact that if it were true there would necessarily exist in space a linear magnitude quite *determinate in it-*

self, yet unknown to us. But I opine that, despite the empty word-wisdom of the metaphysicians, in reality we know little or nothing of the true nature of space, so much so that we are not at liberty to characterise as *absolutely impossible* things that strike us as unnatural. If the non-Euclidean geometry were the true geometry, and the constant in a certain ratio to such magnitudes as lie within the reach of our measurements on the earth and in the heavens, it could be determined *a posteriori*. I have, therefore, in jest frequently expressed the desire that the Euclidean geometry should not be the true geometry, because in that event we should have an absolute measure *a priori*."

Schweikart, a contemporary of Gauss, may incidentally be mentioned as having worked out a geometry that would be independent of the Euclidean axiom. He called it astral geometry.[1]

Gauss's ideas fell upon good soil in his disciple Riemann (1826–1866) whose Habilitation Lecture on "The Hypotheses which Constitute the Bases of Geometry" inaugurates a new epoch in the history of the philosophy of mathematics.

Riemann states the situation as follows. I quote from Clifford's almost too literal translation (first published in *Nature*, 1873):

"It is known that geometry assumes, as things given, both the notion of space and the first principles of constructions in space. She gives definitions of them which are merely nominal, while the true determinations appear in the form of axioms. The relation of these assumptions remains consequently in darkness; we neither perceive whether and how far their connection is necessary, nor, *a priori*, whether it is possible.

"From Euclid to Legendre (to name the most famous of modern reforming geometers) this darkness was cleared up neither by mathematicians nor by such philosophers as concerned themselves with it."

Riemann arrives at a conclusion which is negative. He says:

"The propositions of geometry cannot be derived from general notions of magnitude, but the properties which distinguish space from other conceivable triply extended magnitudes are only to be deduced from experience."

In the attempt at discovering the simplest matters of fact from which the measure-relations of space may be determined, Riemann declares that—

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[1] *Die Theorie der Parallellinien, nebst dem Vorschlag ihrer Verbannung aus der Geometrie.* Leipzig und Jena. 1807.

"Like all matters of fact, they are not necessary, but only of empirical certainty; they are hypotheses."

Being a mathematician, Riemann is naturally bent on deductive reasoning, and in trying to find a foothold in the emptiness of pure abstraction he starts with general notions. He argues that position must be determined by measuring quantities, and this necessitates the assumption that length of lines is independent of position. Then he starts with the notion of manifoldness, which he undertakes to specialise. This specialisation, however, may be done in various ways. It may be continuous, as is geometrical space, or consist of discrete units, as do arithmetical numbers. We may construct manifoldnesses of one, two, three, or n dimensions, and the elements of which a system is constructed may be functions which undergo an infinitesimal displacement expressible by dx. Thus, spaces become possible in which the directest linear functions (analogues to the straight lines of Euclid) cease to be straight and suffer a continuous deflection which may be positive or negative, increasing or decreasing.

Riemann argues that the simplest case will be, if the differential line-element ds is the square root of an always positive integral homogeneous function of the second order of the quantities dx in which the coefficients are continuous functions of the quantities x, viz., $ds = \sqrt{\Sigma dx^2}$, but it is one instance only of a whole class of possibilities. He says:

"Manifoldnesses in which, as in the Plane and in Space, the line-element may be reduced to the form $\sqrt{\Sigma dx^2}$, are therefore only a particular case of the manifoldnesses to be here investigated; they require a special name, and therefore these manifoldnesses in which the square of the line-element may be expressed as the sum of the squares of complete differentials I will call *flat*."

The Euclidean plane is the best-known instance of flat space being a manifold of a zero curvature.

Flat space has also been called by the new-fangled word *homaloidal* (from ὁμαλός, level), which recommends itself as a term in distinction from the popular meaning of even.

In applying his determination of the general notion of a manifold to actual space, Riemann expresses its properties thus:

"In the extension of space-construction to the infinitely great, we must distinguish between *unboundedness* and *infinite extent*; the former belongs to the extent-relations, the latter to the measure-relations. That space as an unbounded threefold manifoldness, is an assumption which is developed by every conception of the outer world; according to which every instant the region of real perception is completed and the possible positions of a sought object are constructed, and which by these applications is forever confirming itself. The unboundedness of space possesses in this way a greater empirical certainty than any external experience. But its infinite extent by no means follows from this; on the other hand, if we assume independence of bodies from position, and therefore ascribe to space constant curvature, it must necessarily be finite, provided this curvature has ever so small a positive value. If we prolong all the geodesics starting in a given surface-element, we should obtain an unbounded surface of constant curvature, i. e., a surface which in a *flat* manifoldness of three dimensions would take the form of a sphere, and consequently be finite."

It is obvious from these quotations that Riemann is a disciple of Kant. He was inspired mainly by his teacher Gauss and by Herbart. But while he starts a transcendentalist, employing mainly the method of deductive reasoning, he arrives at results which would stamp him as an empiricist of the school of Mill. He concludes that the nature of real space, which is only one instance among many possibilities, must be determined *a posteriori*. The problem of tridimensionality and homaloidality are questions which must be decided by experience, and while upon the whole he seems inclined to grant that Euclidean geometry is the most practical for a solution of the coarsest investigations, he is inclined to believe that real space is non-Euclidean. Though the derivation from the Euclidean standard can only be slight, there is a possibility of determining it by exact measurement and observation.

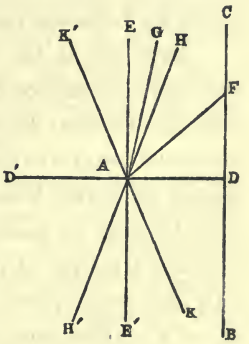
Riemann has succeeded in impressing his view upon metageometers down to the present day. They have built higher and introduced new ideas, yet the corner-stone of metageometry remained the same. It will therefore be found recommendable in a discussion of the problem to begin with a criticism of his Habilitation Lecture.

It is regrettable that Riemann was not allowed to work out his philosophy of mathematics. He died at the premature age of forty, but his work was continued by two other friends of Gauss,

Lobatchevsky and Bolyai, who actually contrived a geometry independent of the theorem of parallels.

It is perhaps no accident that the two independent and almost simultaneous inventors of a non-Euclidean geometry are original, not to say wayward, characters living on the outskirts of European civilisation, the one a Russian, the other a Magyar.

Nicolai Ivanovich Lobatchevsky[1] was born Oct. 22 (Nov. 2 of our calender), 1793, in the town of Makariev, about 40 miles above Nijni Novgorod on the Volga. His father was an architect; at his death in 1797 his widow and two small sons were left in poverty. At the gymnasium Lobatchevsky was noted for his wilfulness and disobedience, and he escaped expulsion only through the protection of his mathematical teacher, Professor Bartels, who even then recognised the extraordinary talents of the boy. Lobatchevsky graduated with distinction and became in his further career professor of mathematics and in 1827 Rector of the University of Kasan. Two books of his offered for official publication were rejected by the paternal government of Russia, and the manuscripts may be considered as lost for good. Of his several essays on the theories of parallel lines we mention only the one which made him famous throughout the whole mathematical world, *Geometrical Researches on the Theory of Parallels.*[2]



Lobatchevsky divides all lines, which in a plane go out from a point A with reference to a given straight line BC in the same plane, into two classes—cutting and not cutting. In progressing from the not-cutting lines, such as EA and GA, to the cutting lines, such as FA, we must come upon one HA that is the boundary between the two classes; and it is this which he calls the par-

[1] The name is spelled differently according to the different methods of transcribing Russian characters.

[2] For further details see Prof. G. B. Halsted's article "Lobachévski" in *The Open Court*, 1898, pp. 411 ff.

allel line. He designates the parallel angle on the perpendicular ($p = AD$, dropped from A upon BC) by Π. If $\Pi(p) < \frac{1}{2}\pi$ (viz., 90 degrees) we shall have on the other side of p another angle $DAK = \Pi(p)$ parallel to DB, so that on this assumption we must make a distinction of *sides in parallelism*, and we must allow two parallels, one on the one and one on the other side. If $\Pi(p) = \frac{1}{2}\pi$ we have only intersecting lines and one parallel; but if $\Pi(p) < \frac{1}{2}\pi$ we have two parallel lines as boundaries between the intersecting and non-intersecting lines.

We need not further develop Lobatchevsky's idea. Among other things, he proves that "if in any rectilinear triangle the sum of the three angles is equal to two right angles, so is this also the case for every other triangle," that is to say, each instance is a sample of the whole, and if one case is established, the nature of the whole system to which it belongs is determined.

The importance of Lobatchevsky's discovery consists in the fact that the assumption of a geometry from which the parallel axiom is rejected, does not lead to self-contradictions but to the conception of a general geometry of which the Euclidean is one possibility. This general geometry was later on most appropriately called by Lobatchevsky "Pangeometry."

John (or, as the Hungarians say, János) Bolyai imbibed the love of mathematics in his father's house. He was the son of Wolfgang (or Farkas) Bolyai, a fellow student of Gauss at Göttingen when the latter was nineteen years old and was professor of mathematics at Maros Vásárhely. Farkas wrote a two-volume book on the elements of mathematics[1] and in it he incidentally mentions his vain attempts at proving the axiom of parallels. His book was only partly completed when his son János wrote him of his discovery of a mathematics of pure space. He said:

"As soon as I have put it into order, I intend to write and if possible to publish a work on parallels. At this moment, it is not yet finished, but the way which I have followed promises me with certainty the attainment of my aim, if it is at all attainable. It is not yet attained, but I have discovered such magnificent things

[1] *Tentamen juventutem studiosam in elementa matheos* etc. *introducendi*, printed in Maros Vásárhely.

that I am myself astonished at the result. It would forever be a pity, if they were lost. When you see them, my father, you yourself will concede it. Now I cannot say more, only so much that *from nothing I have created another wholly new world.* All that I have hitherto sent you compares to it as a house of cards to a castle."[1]

János being convinced of the futility of proving Euclid's axiom, constructed a geometry of absolute space which would be independent of the axiom of parallels. And he succeeded. He called it the *Science Absolute of Space*,[2] an essay of twenty-four pages which Bolyai's father incorporated in the first volume of his *Tentamen* as an appendix.

Bolyai was a thorough Magyar. He was wont to dress in high boots, short wide Hungarian trousers, and a white jacket. He loved the violin and was a good shot. While serving as an officer in the Austrian army, János was known for his hot temper, which finally forced him to resign his commission as a captain, and we learn from Halsted that for some provocation he was challenged by thirteen cavalry officers at once. János calmly accepted and proposed to fight them all, one after the other, on condition that he be permitted after each duel to play a piece on his violin. We know not the nature of these duels nor the construction of the pistols, but the fact remains assured that he came out unhurt. As for the rest of the report that "he came out victor from the thirteen duels, leaving his thirteen adversaries on the square," we may be permitted to express a mild but deep-seated doubt.

János Bolyai starts with straight lines in the same plane, which may or may not cut each other. Now there are two possibilities: there may be a system in which straight lines can be drawn which do not cut one another, and another in which they all cut one another. The former, the Euclidean, he calls Σ, the latter S. "All theorems," he says, "which are not expressly asserted for Σ or for S are enunciated absolutely, that is, they are true whether Σ or S is

[1] See Halsted's introduction to the English translation of Bolyai's *Science Absolute of Space*, p. xxvii.

[2] *Appendix scientiam spatii absolute veram exhibens: a veritate aut falsitate axiomatis XI. Euclidei (a priori haud unquam decidenda) independentem; Adjecta ad casum falsitatis quadratura circuli geometrica.*

reality."[1] The system S can be established without axioms and is actualised in spherical trigonometry (*ibid. p.* 21). Now S can be changed to Σ, viz., plane geometry, by reducing the constant i to its limit (where the sect $y = 0$) which is practically the same as the construction of a circle with $r = \infty$, thus changing its periphery into a straight line.

The labors of Lobatchevski and Bolyai are significant in so far as they prove beyond the shadow of a doubt that a construction of geometries other than Euclidean is possible and that it involves us in no absurdities or contradictions. This upset the traditional trust in Euclidean geometry as absolute truth, and it opened at the same time a vista of new problems, foremost among which was the question as to the mutual relation of these three different geometries.

It was Cayley who proposed an answer which was further elaborated by Felix Klein. These two ingenious mathematicians succeeded in deriving by projection all three systems from one common aboriginal form called by Klein *Grundgebild* or the Absolute. In addition to the three geometries hitherto known to mathematicians, Klein added a fourth one which he calls *elliptic*.[2]

Thus we may now regard all the different geometries as three species of one and the same genus and we have at least the satisfaction of knowing that there is *terra firma* at the bottom of our mathematics, though it lies deeper than was formerly supposed.

Prof. Simon Newcomb of Johns Hopkins University, although not familiar with Klein's essays, worked along the same line and arrived at similar results in his article on "Elementary Theorems Relating to the Geometry of a Space of Three Dimensions and of Uniform Positive Curvature in the Fourth Dimension.[3]

In the meantime the problem of geometry became interesting to outsiders also, for the theorem of parallel lines is a problem of

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[1] See Halsted's translation, p. 14.

[2] "Ueber die sogenannte nicht-euklidische Geometrie" in *Math. Annalen*, 4, 6 (1871–1872). *Vorlesungen über nicht-euklidische Geometrie*, Göttingen. 1893.

[3] Crelle's *Journal für die reine und angewandte Mathematik.* 1877.

space. The best treatment of the subject came from the pen of the great naturalist Helmholtz whose two essays are so interesting because written in a most popular style.[1]

A collection of all the materials from Euclid to Gauss, compiled by Paul Stäckel and Friedrich Engel under the title *Die Theorie der Parallellinien von Euklid bis auf Gauss, eine Urkundensammlung zur Vorgeschichte der nicht-euklidischen Geometrie*, is perhaps the most useful and important publication in this line of thought, a book which has become indispensable to the student of metageometry and its history.

A store of information may be derived from Bertrand A. W. Russell's essay on the *Foundations of Geometry*. He divides the history of metageometry into three periods: The synthetic, consisting of suggestions made by Legendre and Gauss; the metrical, inaugurated by Riemann and characterised by Lobatchevsky and Bolyai; and the projective, represented by Cayley and Klein, who reduce metrical properties to projection and thus show that Euclidean and non-Euclidean systems may result from "the absolute."

Among modern writers no one has done more in the interest of metageometry than the indefatigable Dr. George Bruce Halsted, Professor of Mathematics in the University of Texas.[2] He has not only translated Bolyai and Lobatchevsky, but has also offered his own theories toward the solution of the problem.

Prof. B. J. Delbœuf and Prof. H. Poincaré have expressed their conceptions as to the nature of the bases of mathematics, in

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[1] "Ueber die thatsächlichen Grundlagen der Geometrie," in *Wissenschaftl. Abh.*, 1866, Vol. II., p. 610 ff., and "Ueber die Thatsachen, die der Geometrie zum Grunde liegen," *ibid.*, 1868, p. 618 ff.

[2] From among his various publications we mention only his translations: *Geometrical Researches on the Theory of Parallels by Nicholaus Lobatchewsky.* Translated from the Original. And (2) *The Science Absolute of Space, Independent of the Truth or Falsity of Euclid's Axiom XI. (which can never be decided a priori). By John Bolyai.* Translated from the Latin, both published in Austin, Texas, the translator's present place of residence. Further, we refer the reader to Halsted's bibliography of the literature on hyperspace and non-Euclidean Geometry in the *American Journal of Mathematics*, Vol. I., pp. 261–276, 384, 385, and Vol. II., pp. 65–70.

articles contributed to *The Monist*.[1] The latter treats the subject from a purely mathematical standpoint, while Dr. Ernst Mach in his essay "On Physiological, as Distinguished from Geometrical, Space" (published in *The Monist* for April, 1901) attacks the problem in a very original manner and takes into consideration mainly the natural growth of space conception. His exposition might be called "the physics of geometry."

I cannot conclude this essay without paying a tribute to the memory of Hermann Grassmann of Stettin, a mathematician of first degree whose highly important results in this line of work have only of late found the recognition which they so fully deserve. I do not hesitate to say that Hermann Grassmann's *Lineare Ausdehnungslehre* is the best work on the philosophical foundation of mathematics from the standpoint of a mathematician.

Grassmann establishes first the idea of mathematics as the science of pure form. He shows that the mathematician starts from definitions. He then proceeds to show how the product of thought may originate either by the single act of creation, or by the double act of positing and combining. The former is the continuous form, or magnitude, in the narrower sense of the term, the latter the discrete form or the method of combination. He distinguishes between intensive and extensive magnitude and chooses as the best example of the latter the sect[2] or limited straight line. Hence the name of the new science, "theory of linear extension."

Grassmann constructs linear formations of which systems of one, two, three, and n degrees are possible. The Euclidean plane is a system of second degree, and space a system of third degree, He thus generalises the idea of mathematics, and having created a

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[1] They are as follows: "Are the Dimensions of the Physical World Absolute?" by Prof. B. J. Delbœuf, *The Monist*, January, 1894; "On the Foundations of Geometry," by Prof. H. Poincaré, *The Monist*, October, 1898; also "Relations Between Experimental and Mathematical Physics," *The Monist*, July, 1902.

[2] Grassmann's term is *Strecke*, a word connected with the Anglo-Saxon "Stretch," being that portion of a line that stretches between two points. The translation "sect," than which there is no better, was suggested by Prof. G. B. Halsted.

science of pure form, points out that geometry is one of its applications which originates under definite conditions. Grassmann made the straight line the basis of his geometrical definitions. He defines the plane as the totality of parallels which cut a straight line and space as the totality of parallels which cut the plane. Here is the limit to geometrical construction, but abstract thought knows of no bounds. Having generalised our mathematical notions as systems of first, second, and third degree, we can continue in the numeral series and construct systems of four, five, and still higher degrees. Further, we can determine any plane by any three points, given in the figures x_1, x_2, x_3, not lying in a straight line. If the equation between these three figures be homogeneous, the totality of all points that correspond to it will be a system of second degree. If this homogeneous equation is of the first grade, this system of second degree will be simple, viz., of a straight line; but if the equation be of a higher grade, we shall have curves for which not all the laws of plane geometry hold good. The same considerations lead to a distinction between homaloidal space and non-Euclidean systems.[1]

Being professor at a German gymnasium and not at a university, Grassmann's book remained neglected and the newness of his methods prevented superficial readers from appreciating the sweeping significance of his propositions. Since there was no call whatever for the book, the publishers returned the whole edition to the paper mill, and the complimentary copies which the author had sent out to his friends are perhaps the sole portion that was saved from the general doom.

Grassmann, disappointed in his mathematical labors, had in the mean time turned to other studies and gained the honorary doctorate of the University of Tübingen in recognition of his meritorious work on the St. Petersburg Sanskrit Dictionary, when Victor Schlegel called attention to the similarity of Hamilton's theory of vectors to Grassmann's concept of *Strecke*, both being limited straight lines of definite direction. Suddenly a demand for Grass-

[1] See Grassmann's *Ausdehnungslehre* von 1844, Anhang I., pp. 273–274.

mann's book was created in the market; but alas! no copy could be had, and the publishers deemed it advisable to reprint the destroyed edition of 1844. The satisfaction of this late recognition was the last joy that brightened the eve of Grassmann's life. He wrote the introduction and an appendix to the second edition of his *Lineare Ausdehnungslehre*, but died while the forms of his book were on the press.

At the present day the literature on metageometrical subjects has grown to such an extent that we do not venture to enter into further details. We will only mention the appearance of Professor Schoute's work on more-dimensional geometry[1] which promises to be the elaboration of the pangeometrical ideal.

Having reviewed all the attempts made to establish non-Euclidean systems of geometry, it may not be out of place to state, that in spite of the well-deserved fame of the metageometricians from Wallis to Halsted, Euclid's claim to classicism remains unshaken. The metageometrical movement is not a revolution against Euclid's authority but an attempt at widening our mathematical horizon. Let us hear what Halsted, one of the boldest and keenest heroes among the champions of metageometry of the present day, has to say of Euclid. Halsted begins the Introduction to his English translation of *Bolyai's Science Absolute of Space* with a terse description of the history of his great book *The Elements of Geometry*, the rediscovery of which is not the least factor that initiated a new epoch in the development of Europe which may be called the era of inventions, of discoveries, and of the appreciation as well as growth of science. Halsted says:

"The immortal *Elements* of Euclid was already in dim antiquity a classic, regarded as absolutely perfect, valid without restriction.

"Elementary geometry was for two thousand years as stationary, as fixed, as peculiarly Greek, as the Parthenon. On this foundation pure science rose in Archimedes, in Apollonius, in Pappus; struggled in Theon, in Hypatia; declined in Proclus; fell into the long decadence of the Dark Ages.

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[1] *Mehrdimensionale Geometrie* von Dr. P. H. Schoute, Professor der Math. an d. Reichs-Universität zu Groningen, Holland. Leipzig, Göschen's Verlag. So far only the first volume, which treats of linear space, has appeared.

"The book that monkish Europe could no longer understand was then taught in Arabic by Saracen and Moor in the Universities of Bagdad and Cordova.

"To bring the light, after weary, stupid centuries, to western Christendom, an Englishman, Adelhard of Bath, journeys, to learn Arabic, through Asia Minor, through Egypt, back to Spain. Disguised as a Mohammedan student, he got into Cordova about 1120, obtained a Moorish copy of Euclid's *Elements*, and made a translation from the Arabic into Latin.

"The first printed edition of Euclid, published in Venice in 1482, was a Latin version from the Arabic. The translation into Latin from the Greek, made by Zamberti from a MS. of Theon's revision, was first published at Venice in 1505.

"Twenty-eight years later appeared the *editio princeps* in Greek, published at Basle in 1533 by John Hervagius, edited by Simon Grynaeus. This was for a century and three-quarters the only printed Greek text of all the books, and from it the first English translation (1570) was made by 'Henricus Billingsley,' afterward Sir Henry Billingsley, Lord Mayor of London in 1591.

"And even to-day, 1895, in the vast system of examinations carried out by the British Government, by Oxford, and by Cambridge, no proof of a theorem in geometry will be accepted which infringes Euclid's sequence of propositions.

"Nor is the work unworthy of this extraordinary immortality.

"Says Clifford: 'This book has been for nearly twenty-two centuries the encouragement and guide of that scientific thought which is one thing with the progress of man from a worse to a better state.

"'The encouragement; for it contained a body of knowledge that was really known and could be relied on.

"'The guide; for the aim of every student of every subject was to bring his knowledge of that subject into a form as perfect as that which geometry had attained.'"

Euclid's *Elements of Geometry* are not counted among the books of divine revelation, but truly they deserve to be held in religious veneration. There is a sanctity in mathematical truth which is not sufficiently appreciated, and certainly if truth, helpfulness, and directness and simplicity of presentation, give a title to rank as divinely inspired literature, Euclid's great work should be counted among the canonical books of mankind.

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The author has purposely introduced what might be called a personal element in these expositions of a subject which is commonly regarded as dry and abstruse, and endeavored to give something of the lives of the men who have struggled and labored

in this line of thought and have sacrificed their time and energy on the altar of one of the noblest aspirations of man, the delineation of a philosophy of mathematics.

There is one more point which should be mentioned in this connection. It is the close analogy which mathematics bears to religion. We have first the rigid presentation of mathematical truth discovered (as it were) by instinct, by a prophetic divination, for practical purposes, in the shape of a dogma as based upon axioms, which is followed by a period of unrest, being the search for a philosophical basis, which finally leads to a higher standpoint from which, though it acknowledges the relativity of the primitive dogmatism, consists in a recognition of the eternal verities on which are based all our thinking, and being, and yearning.

Is there any need of warning our readers that this sketch of the history of metageometry is both brief and popular? We have purposely avoided the discussion of technical details, limiting our exposition to the most essential points and trying to show them in a light that will render them interesting to the non-mathematical reader also. The article is intended to serve as an introduction to a ventilation of the problem itself, and the author proposes to continue the subject in a discussion anent the foundation of mathematics—an article which he hopes to be able to submit to his readers in a subsequent number of *The Monist*. He has abstained from criticising the views of his predecessors because he wishes first to submit his own solution to the criticism of professional mathematicians.

EDITOR.

PRIMITIVE THEORIES OF KNOWLEDGE: A STUDY IN LINGUISTIC PSYCHOLOGY.

INSPECTION of the words which, in various languages, express the idea "to know," reveals the fact that, with different peoples, these have sprung from different roots. In other words, there have been, as there are now, several primitive theories of knowledge, each basing itself upon one of the senses in particular, to the greater or less exclusion of some or of all of the rest.

The Zapotecs of the state of Oaxaca, whose ancestors were one of the half-civilised nations of old Mexico, had a very simple theory of knowledge. In their language, Dr. Brinton (*Amer. Antiq.*, 1893, p. 382) tells us: "The verb 'to know' is a reduplication of the first person of the personal pronoun, *na*, 'I'; *na-na*, 'to know,' literally, 'my mine,' 'that which is with me, essentially mine' It is absolutely the same in the Huasteca dialect of the Mayan stock." The name *Nahuatl* (the plural *Nahua* is applied to the people themselves), by which the language of ancient Mexico is known, signifying "able, skilful, superior," is derived, according to the same authority, from "the monosyllable *na*, which, in several closely related linguistic stocks in Southern Mexico, means 'to know, knowledge.'"

Dr. Brinton points out the resemblance in these tongues between the word for "knowledge, know," and the pronoun of the first person, observing further: "The man possessed of knowledge is everywhere he who is able. He *can* because he *kens*. There is no need to teach the world the Baconian maxim: 'Knowledge is power'; it is always recognised." In our own language *can*, *ken*, *know*, are all closely related, but are not exactly the same word. *Can* and *know* (with German *können*, Latin *gnoscere*, Greek γιγνώσκειν, Sanskrit *jnâ*) go back to a primitive Indo-European root *gen* (*gne*, *gno*), "to recognise, know," which by some authorities is thought to be kin with the radical *gen*, "to produce, bear," but the seeming identity may be quite accidental. *Ken*, cognate with German *kennen*, has come into English from the Scandinavian, and is really a causal verb signifying originally "to make to know," "to show," "to teach." From the root *gen* come ultimately the German *Kunst*, "art" (in the older language also "wisdom, skill"); the Greek γνῶσις, "knowledge"; the Latin *notion* (whence our "notion"), "making acquainted" (then "idea"); English *cunning*, "knowledge, skill" (now com-

monly with an implication of deceit or underhandedness), borrowed from the Icelandic. As Trench has pointed out (*Select Gloss.*, 1879, p. 63), the sense of "crooked knowledge" (Bacon already wrote: "We take *cunning* for a sinister or crooked wisdom") is not the earliest English meaning of the term, for Fox, in his *Book of Martyrs*, published in 1562, could say of the persons of the Trinity "all these three Persons are even in power, and in *cunning*, and in might." The modern American application of *cunning* to pictures, babies, birds, trees, houses, flowers, teeth, anything indeed, is a notional *tour de force*, a linguistic triumph, although it seems to have been largely anticipated in most of its senses by the writers of the Elizabethan era in England.

From the same Indo-European root *gen* is derived the Teutonic *kóni*, "knowing, wise," which, with some changes in sound and signification, appears in English *keen*, "sharp, eager, acute"; Icelandic *kœnn*, "wise, experienced"; German *kühn*, "bold." The original implication of *keen* may have been "wise or able in battle," "skilled in the use of war-weapons," since, as Kluge (*Etym. Wörterb.*, 1894, p. 220) remarks, many of the intellectual and moral ideas of the primitive Teutons are based upon the experiences of war and combat,—out of the struggle for existence has grown the knowledge of men. Knowledge born of trial the Latins called *experientia*, "what one has gone through." Goethe, the great German poet, crystallised the old race-thought, when he declared that "experience is the only genuine knowledge." Science too, to-day, is genuine through experiment. We *know* only after we have *done*, or, at least, *tried*, *experimented*. The Greek ἐμπειρία (whence our *empiricism*), "experience, knowledge," comes from πεῖρα, "trial." The word *science*, through the Latin *scientia*, "knowledge, skill, expertness, science," comes from the verb *scire*, "to know (in the widest sense), understand, be skilled in." The primitive meaning of *scire* seems to have been "to distinguish, to discern,"—more primitively still, "to split, divide."

Back to the same Indo-European root we can trace our English word *skill*. Philosophy, as a branch of human knowledge, thus comes quite naturally by its "hair-splitting" proclivities. From a similar radical, with like meaning, are derived the Latin *certus* (whence our "certain," etc.), *cernere*, "to separate, distinguish, perceive, decide" (whence our "discern"), etc. The German *gescheit*, "wise, clever, sensible," is derived ultimately from the Indo-Germanic root *skhaid*, "to split, separate," and even to-day "*splitting* the difference" is often the cleverest way out of a dispute.

When we speak of "a *sapient* young man," "a *sapient* remark," "the Divine *Sapience*," we do not always remember the primitive meaning of these words. But the cognate *sapid*, *insipid*, give us the clue to their origin. The Latin *sapere* (whence the French *savoir*), before it came to signify "to be prudent, discreet, wise," "to know, understand," meant "to taste, savor, smack." It is an interesting fact that the French, who are pre-eminently the people of "taste," should have selected this particular Latin word as their general term for "to know." In Eng-

lish we still say "a *smack* of knowledge." The *sage*, for the word comes from the Latin *sapius*, is a man of "taste," therefore, as the *wise* man is one of "sight." It is worth remembering also that it was after "*tasting* of the fruit of the tree of *knowledge*," according to the Hebrew Scriptures, that the first human beings became as gods "*knowing* good and evil."

Sprachgefühl still makes us speak, with unconscious correctness, of "the *sagacity* of a hound." The words *sagacity* and *sagacious*, which connect themselves with the Latin adjective *săgax* ("wise, sagacious, keen, acute, shrewd"; but, more primitively, "keen or quick scented") and the verb *săgire* ("to perceive keenly by the senses, perceive, see acutely"; primitively "to scent out") are really smell-terms. The original sense of *săgire* seems to have been "to scent out, trace, track"; and from the same old Aryan root *săg* have been developed English *seek*, German *suchen* (Gothic *sokjan*) and their cognates. Here the knower is "the seeker after," "the scenter out," just as to-day among the Zulus of South Africa, the primitive sage or shaman is "the *smeller out* of witches." To the savage mind even in the world beyond the grave the final test of knowledge is sometimes *smell*. With the inhabitants of certain districts of Borneo the practice prevails of whispering a message into the ear of the dead, and M. Hose (*Geogr. Journ.*, 1893, p. 198) informs us: "Upon his [the funeral was that of a boy] arrival in Appo Leggan (i. e., Hades) they would probably greet him in terms such as these: 'O Grandchild, it was for you the gong was beating, which we heard just now. What have you brought? How are they all up above? Have they sent any messages?' The new arrival then delivers the messages entrusted to him, and gives the cigarettes [which, rolled up in a piece of banana-leaf, have been placed in his hand] as proof of the truth of what he says. These cigarettes retain the *smell* of the hands which made them, which the dead relations are able to recognise."

Dr. D. G. Brinton (*Pursuit of Happiness*, 1893, p. 132) calls attention to the fact that of old the pleasures of the sense of smell "were considered the most delightful of all, even to Divinity itself." Hence the "sweet savor" which Jahveh liked to smell, the "odor of sanctity," etc., besides the countless metaphors and similes, alike in literature and in folk-thought in which the sense of smell or the nose figures as the representative of what is pleasantly perceived or known. Our words *smell* and *perfume* literally "end in *smoke*,"—for "smoke" is their ultimate signification. Curiously enough, *Geruch*, the German word for the sense of smell, has a similar origin, going back, with *riechen* ("to smell"), our English *reek*, and the German substantive *Rauch*, "smoke," to a Teutonic radical *ruk*, whose primitive meaning is "to smoke." The German word for "taste," *Geschmack*, is of mixed physiological and psychological heredity,—the Middle High German *smac* signified "taste, smell, scent."

The English *scent* is derived from Latin *sentire*, "to feel, perceive by the senses, hear, see, smell, taste,"—a word of broad meaning psychically and physio-

logically. Of like broad significance is the Latin *sensus*, whence our *sense*, with its cognates in other languages, borrowing from the Latin or Romance tongues *Sentire*, as Kluge notes, is related to the Irish *sêt*, "way, path," the Latins having given to the idea of "feeling one's way" (as we even yet term it in English) an abstract turn. *Sinn*, the German word for "sense" has a like origin. Together with *sinnen*, which in Old High German had the meaning "to travel, strive to go,"—possibly the later meaning of the word has been influenced by the Latin *sensus*,—the word *Sinn* comes from the Teutonic root *sintha* ("road, journey"), seen in Gothic *sinths* and cognate with Irish *sét*, all of which, with the Latin *sentire*, go back to a primitive Indo-European radical, of which the branches are *sent-* "to direct towards, think of," *sento*, "path, way," and *sen*, "to go, travel, strive, think."

The idea of *thought* as *travel* is known to not a few primitive peoples, and modern *telepathy* revives the old conception. When we say "there is no royal *road* to learning," we are repeating an ancient story. The "*avenues* of the senses" are older than physiological psychology. In the religions and philosophies of the world, "ways" have been very prominent. We have the "Royal Path" and the "Heavenly Path" of Confucius, the *Taou* or "Way" of Laou-Tze, the "Noble Path" ("Four Paths") of Buddhism, the "Way" of Christianity, etc. Moreover, the *Pontiff* of the Roman Church, as his Latin name, *pontifex*, indicates, had a predecessor, who was simply "the pathmaker." πεῖρα, the root of the Greek ἐμπειρία, "experience, knowledge," is connected with πόρος, "a way" and our English *fare*.

The *philosopher* and the *sophist*, if we trust the accepted etymologies of these words, are both men of "taste." For the Greek σοφία, "wisdom," σοφός, "skilful, intelligent, wise," are close kin of σάφης, "clear, sure, unerring," a term applied to seers, etc. As the Greek word ὀπός ("juice, sap produced by incision"), the equivalent of the Latin *sapor*, proves, both σοφός and σάφης must have meant originally "of a keen, decided taste," "tasty," and then, secondarily, "clear, evident, sure unerring, wise." Colloquial American English, with its *sappy* and *saphead*, seems to have gone in the opposite direction to ancient Greek.

We have in English a famous children's rhyme, "Open your mouth, and shut your eyes, And I'll give you something to make you wise." Here taste and wisdom are correlated. The etymology of *wisdom* and *wise* does not, however, bear out the inference of the rhyme. English *wise* and its cognates in the various Teutonic languages (German *weise*, etc.) are verbal adjectives from the Indo-European radical *wid* or *wit*, "to know," which has likewise produced the English "to *wit*" and the German *wissen*, besides the Latin *videre*, "to see," which latter reveals the original meaning of the root—"to *know*" is "to *see*." The noun *wit*, which survives in a special sense in English (compare German *Witz*, etc.), is, therefore, etymologically at least, "sight," and "first sight," perhaps, not the "second sight" of the folk. From the same root come ultimately *witch* and *wiseacre*, the

last borrowed from Dutch, and replacing the Anglo-Saxon *witiga*, "prophet, soothsayer, wizard, seer," of which *witch* is a corruption. *Wizard*, too, belongs in the same category. In Modern High German the adjective *weis* also occurs, in the phrase "einem etwas *weis* machen," meaning "to hoax anybody." The extension of meaning of *wit* still survives in "to have one's *wits* about him," and the plural "wits" continues to be used as a synonym for "senses." Tennyson says:

"Alone and warming his five wits,
The white owl in the belfry sits."

When we cannot "see our way clear" to do anything, we are said to be "at our wits' end." The English *seer*, "prophet, wise man," is a nobler term than the similarly originating *clairvoyant* and cognates of these later days. The colloquial American *seel* belongs in this category also. German *naseweis*, "pert, saucy, inquisitive" (literally, "*nose*-wise") is also of interest here. But German has likewise *Wissenschaft*, "science." Primitive languages offer similar facts. In the speech of the Tacana Indians of Bolivia, according to Dr. D. G. Brinton (*Stud. in S. Amer. Lang.*, 1892, p. 13), the terms *babe-quisa*, "to teach," *babe-tsua*, "to learn," *babe*, "to know," are all derivatives from the root *ba*, "to see." From *ba*, "to see," comes also the term *diaba* (*dia* = "to eat"), "to taste," literally, "to eat, seeing."

Such terms as *sharp* (whence "sharper"), *acute*, and their cognates in all languages, are self-explanatory, so common is it to consider the mind *keen*, *scharfsinnig*, etc. English *shrewd*, to which commercialism has given a somewhat higher meaning than it formerly possessed ("malicious, wicked, *shrew*-like," then "cunning, acute," etc.) goes back to the animal, whose Latin name *mus aranea* betrays its evil character in folk-thought. *Astute* is a derivative from the Latin *astus*, "craft, cunning," the etymology of which is uncertain,—perhaps "city bred." A very interesting knowledge-word is English *craft* ("skill, ability, trade") which in Middle English signified "might, power, ability, art, craft, deceit,"—and the corresponding M. H. G. adjective *crafti*, "skilful, sly," our *crafty*, "cunning, sly." The cognate Modern High German word *Kraft* signifies, like Dutch *Kracht* and Danish *kraft*, "power, strength, force," but the M. H. G. and O. H. G. word had the meanings "strength, power, force of an army, multitude, abundance" and the Anglo-Saxon *craeft*, besides these, meant also "mental capacity, art, science." The final etymology of *craft* is doubtful, but Skeat suggests kinship with *cramp*, and derivation from the Teutonic radical *krap*, "to draw forcibly together." If this etymology be true, it is curious that the verb "to *cram*" is cognate. *Craft* is evidently a word which has undergone, as Kluge (*Etym. Dict.*, p. 190) points out, specialisation within the mental sphere, the English *crafty* being the latest development.

Equally interesting, perhaps, is the old Latin word *sollers*, "intelligent, skilled, sagacious, cunning, wily, crafty," derived from *sollus*, "all, entire," and

ars, "art, faculty, skill, ability, science, profession," etc.; a term having much the same significance as *craft*. The literal signification of the Latin *ars* (compare *artus*, "limb, joint") is "skill in joining, putting together,"—we still say in English "to put two and two together." The "*art* of knowledge" is "putting things together."

Somewhat similar is the etymology of the Greek τέχνη, "art, skill, craft, cunning, sleight, trade," the primitive signification of which seems to have been "a way of making or doing something,"—the word for "carpenter," τέκτων, is from the same root,—ultimately the radical *t*—*k*, "to shape, form, produce, generate."

The Modern High German *List* (cp. Gothic *lists*) signifies "craft, cunning, deceit," but in M. H. G. and O. H. G. it had the meanings "wisdom, prudence, slyness, cunning, art," etc.,—the cognate Middle English *liste* signified "craft, astuteness," Anglo-Saxon *list*, "art, propriety, cunning," Icelandic *list*, "prudence, skill in an art, propriety." As Kluge (p. 218) observes, the significance of the word fluctuates between "prudence" and "cunning," and the preterite—present *lais*—"I know," in Gothic, indicates the root which is also found in the German *lehren*, "to teach," *lernen* (cp. English *learn*). "to learn," etc. Cognate also are Gothic —*leis*, "knowing,", —*leisei*, "knowledge," *laisjan*, "to teach," *laiseins*, "doctrine."

To the same stock belong also English *lore* (A. S., *lar*), German *Lehre*, and their cognates in other kindred tongues. The radical at the base of all these words is *lis* with the signification "to go through," "experience,"—compare the Latin *peritia*, "experience, skill," and *experientia*, "knowledge, experience." The most primitive sense of *lis* is probably "to go," as the cognate German *Leiste*, which is the same as the English *last* (shoemaker's), Gothic *laists*, "track, goal," Anglo-Saxon *lâst* or *læst*, "footprint, track, forma," serve to indicate. The German verb *leisten*, "to perform, accomplish," O. H. G. and M. H. G., "to adhere to and execute an order, fulfil one's promise or duty," Anglo-Saxon *læstan*, "to perform, accomplish, hold, sustain, endure," belong here, as the Gothic *laistjan* (from *laists*), "to pursue, yield," proves. German *G(e)leise*, "rut, wheel-track," M. H. G. *leis* or *leise*, "trace, track," O. H. G. *leisa*, "track (of waggon)," are of the same stock, as is probably also Latin *lîra*, "furrow," when *delîrare*, "to be delirious, crazy, deranged, out of one's wit," literally, "to go out of the furrow." Of *lis*, the radical of all these knowledge-terms, Kluge says (p. 213): "This root has a constant tendency to pass from the sensuous meaning 'to go, follow,' into an intellectual notion.'

Another Latin word for "craft, cunning, artifice, wile" is *dolus*, probably from Greek δόλος, with like meaning, which appears also in a great many compounds expressive of "subtlety, craftiness, wiliness, cunning, treachery, deceit." The radical of these words is seen in Greek δέλεαρ, "a bait," the original idea of the root *d*—*l* being "to catch with a bait (as fish)." So, the wily knowledge expressed in *dolus* comes ultimately from fishing or trapping.

A common Modern High German term for "wise, knowing, prudent, shrewd," is *klug*, the etymology of which is, apparently, unknown. In M. H. G. the word signified "fine, pretty, tender, superb, brave, polite, prudent, sly." In the Low German dialects (cf. Dutch *klock*,—the word does not occur in modern English) it has the meanings "prudent, brave, great, corpulent," and in Scandinavian *klókr* = "prudent, cunning." Probably the Middle English *glen*, "wise," Anglo-Saxon *gliaw*, "sagacious," is the same word; perhaps also the Scotch *gleg*, "quick of eye," belongs here. The last may reveal the original signification.

There is a very interesting group of knowledge-words, represented by the English loan-words from Latin *apprehend*, *comprehend*, *perceive*, *conceive*, etc., whose very physical basis is revealed in the common expression, "I don't quite *grasp* (or *get*) your meaning." In Latin *apprehendere* signifies "to catch, lay hold of, take, seize, embrace," *comprehendere*, "to lay hold of, catch, apprehend, comprehend, comprise, embrace, perceive, observe, see, understand," etc., and the simpler *prehendere*, "to grasp, seize, catch, take, take in with the eye, seize, apprehend, comprehend." *Prehendere* (the Greek cognate is χανδάνειν, "to take in, hold, be able") is derived from the prefix *pre*, "before," *hendere*, "to seize, get," a word actually akin to the English *get*. So, when we *seize* a point in an argument, *grasp* the situation, or, in the colloquialism of the day, *get on* to anything, we are repeating the phenomena revealed to us by these etymologies. Indeed, what real difference is there between the Latin *apprehendisne* and the street Arab's "*D'ye catch on?*" And in quarters where the language of the street and the forum is tabooed we often hear it said: "I don't *catch* your meaning."

The chief component of *percipere* and *concipere*, which have in Latin both the physical and the psychical significations," is *capere*, "to take hold of, seize, grasp." So, the psychological terms *concept*, *percept*, *recept*, *apperception*, etc., go back to a physical basis. The German verb, *begreifen*, "to comprehend, understand, conceive," and the substantive *Begriff* "conception, idea, notion," are, in like manner derived from the radical represented by *greifen*, "to seize, grasp. lay hold, grip." In English we say "he has lost his *grip*," even with reference to things intellectual.

Like *klug* in German, *clever*, which in English signifies "skilful, dexterous," and as an Americanism "good-natured, with wits below smart,"—in English dialect with meanings including all of these, including "bright (intellectually),"—is of doubtful etymology; Skeat, with apparent justice, considers *clever* to be a metamorphosis of Middle English, "quick, active, nimble, agile," from Old French *delivre*, "quick," literally "freed" (from Latin *de*, *liber*). The oldest meaning of *clever* would seem to be "ready (able) to seize," which brings it into the category of *grasp*-words.

The English *understanding*, *to understand* and the Modern High German *Verstand* ("understanding, intelligence, sense, reason") *verstehen* ("to understand") are very interesting knowledge-terms, whose etymology has not been alto-

gether satisfactorily explained. In M. H. G. *verstant*, a rare word, signifies "explanation," while M. H. G. *verstandnisse*, O. H. G. *firstantnissi*, has the meanings, "intelligence, insight, understanding,"—the verb, M. H. G. *verstân*, O. H. G. *firstân*, signifies "to perceive, see into, notice, understand." Of these words Kluge remarks (p. 377): "How the meaning can be derived from the root of *stehen* is not clear; it is usually related to Greek ἐπίσταμαι, 'understand,' compared with the root *sta*, 'to stand,'" English *understand* presents the same problem. Skeat, however, interprets the Anglo-Saxon *understandan* (from *under*, *standan*) as signifying, literally, "to stand under, or among," and hence "to comprehend," comparing for signification and etymology the Latin *intellegere*, from which comes *intellectus* (whence English *intellect*) *intelligencia* (whence English *intelligence*) and their derivatives in many languages of Europe. *Intelligere* signifies, literally, "to choose between" (*inter*, *legere*), the chief component, *legere*, having the meaning "to gather, pick up," probably as a bird does grains, seeds, etc.

Epistemology, the term by which the philosophers designate the "theory of knowledge," has as its first component the Greek ἐπιστήμη, "knowledge, understanding, skill, experience, wisdom, science," a derivative from the verb ἐπίσταμαι, "to understand, be capable, know how," which is itself derived from the particle ἐπί and ἵστημι, "to cause to stand, erect, establish, place, make fast, fix." The word ἵστημι is lengthened from στάω, from the same Indo-European radical as English *stand*, German *stehen*, and Latin *stare*. There is thus abundant evidence to show that "where one *stands*," with reference to any matter, is a very ancient definition of his knowledge. From the Zapotec Indian to the modern epistemologist is a long way, but language has much of interest wherewith to beguile us as we go.

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CRITICISMS AND DISCUSSIONS.

HILBERT'S FOUNDATIONS OF GEOMETRY.[1]

Since its appearance in 1899 Hilbert's work on *The Foundations of Geometry* has had a wider circulation than any other modern essay in the realms of pure mathematics. As types of the appreciation which it has received, we may refer to the reviews of Sommer,[2] Poincaré,[3] Halsted,[4] and Hedrick.[5] In each case Hilbert's achievement is enthusiastically praised, as well as (in the latter two cases) the enterprise of the publishers and translator of the English edition. Dr. Hedrick's review in particular is valuable for correcting certain errors of detail in the translation that are of importance to the mathematical reader. Since the purpose of the present article is to point out the relation of Hilbert's work to certain less widely known investigations of the same subject, we can here only add the opinion that the translation is a very competent and useful piece of work.

Study of the foundations of geometry began with no more recent a mathematician than Euclid. In giving form to the hitherto unorganised mass of geometrical knowledge, it was necessary to ask the question: What are the statements that it is necessary to presuppose in order logically to deduce from them the properties of space? Euclid's reply to this conundrum was supposed for many centuries to be the only one possible. The non-Euclidean geometry which arose out of vain attempts to prove the axiom of parallels a consequence of the other axioms was the first break in this tradition. Its development has been brilliant and interesting, but we must summarise it in a list of names: Saccheri (1733), Legendre, Gauss, Schweikart, Lobatschewsky, Bolyai, Riemann, Beltrami, Helmholtz, Cayley, Klein, Lie.

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[1] *The Foundations of Geometry*, D. Hilbert. Authorised translation by E. J. Townsend, Ph. D. Chicago: The Open Court Publishing Company, 1902. 8vo. Pages, vii, 132.

[2] An English translation of Sommer's article appeared in the *Bulletin of the American Mathematical Society*, Vol. VI., p. 287. 1900.

[3] *Bulletin des Sciences Mathématiques*, Vol. XXVI., p. 249, September, 1902.

[4] *The Open Court*, September, 1902.

[5] *Bulletin of the American Mathematical Society*, Vol. IX. (1902), p. 158.

The non-Euclidean geometers, however, confined their attention in the main to the axiom of parallel lines, and it was not till about twenty years ago that an attempt was made to recast the entire system. In 1882, in a book called *Vorlesungen über die neuere Geometrie*, Dr. Moritz Pasch published a system of axioms and showed how it was possible from them to deduce the theorems of geometry. The work of Pasch was considerably simplified and improved by Peano,[1] who attacked the problem with the aid of a ratiocinative calculus. An independent attempt was made by another Italian, Veronese,[2] who studied in particular the continuity of space. Veronese's book, which is somewhat obscure, has received a helpful commentary from T. Levi-Civita.[3]

At the time of Hilbert's investigations, the term "mathematical science" had acquired a precise technical meaning. A mathematical science consists of a body of propositions stated about certain elements in terms of certain relations. The elements in Hilbert's system, for example, are denoted by the words "point," "line," "plane." The relations are indicated by such words as "are situated," "between," "congruent." An element is understood to be quite independent of any mental image that may accompany it in our thinking. It has no properties except such as are stated in the propositions. The axioms are a system of propositions such that:

1. Every proposition of the mathematical science in question can be deduced from the axioms.
2. No axiom can be deduced from the other axioms.

Hilbert arranges his axioms in five groups according to the relations to which they give meaning.

I, 1–7. Axioms of connection (involving the term "are situated").
II, 1–5. Axioms of order (involving the term "between").
III, Axiom of parallels.
IV, 1–6. Axioms of congruence.
V, Axiom of continuity.

There are thus twenty axioms in Hilbert's system.

The sense in which an element is independent of the mental images accompanying it is made clear by the method of proving an axiom to be independent,—i. e., not deducible from the others. This is done simply by exhibiting a self-consistent mathematical science, in which all the axioms except the one in question are valid propositions, whereas that one is not. For if the indicted axiom were deducible from the others, it would be a true proposition of the new science.

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[1] Peano, *I principii de Geometria*, Turin, 1889; "Sui Fondamenti della Geometria," *Rivista di Matematica*, Vol. 4 (1894), pp. 51–90.

[2] Veronese, *Fondamenti di Geometria a più dimensioni e a più speciè de unità rettilinee*. Padua, 1891. German translation by Schepp, Leipzig, 1894.

[3] *Memorie della Reale Accademia dei Lincei Roma*, Vol. 7, pp. 91–96, 113–121; 1898.

Take or example the classical case of the Euclidean axiom, Hilbert's III. A mathematical science of the kind required is furnished by the propositions about the points interior to an ordinary sphere. Let the significance in our new science of the words

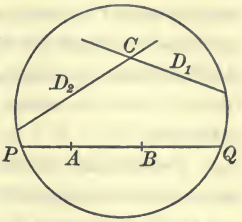
"point" be interior point of the sphere S (not including the boundary of sphere),

"line" be portion of line interior to the sphere S,

"plane" be portion of plane interior to the sphere S.

The relations of order and connection of "points," "lines," and "planes" are as usual, but on a "line" l (which is the portion of the ordinary line bounded by the points P and Q) the "distance" apart of two points A and B shall be

$$\log\left(\frac{AP.\,BQ}{AQ.\,BP}\right)$$



where AP, etc., are distances in the usual sense.

With a similar convention about the meaning of the word "angle," a very little mathematics suffices to show that all the axioms of the groups I, II, IV, V (and of course the theorems deducible from them) are valid propositions about our new "points," "lines," etc. For example, "space" is infinite, for if A is moved toward Q, the "distance AB," as defined, increases indefinitely.

Moreover, unless the Euclidean geometry is at war with itself, these propositions contain no self-contradiction; for if they did, on translating them back into the corresponding properties of the sphere the contradiction would remain and therefore the Euclidean geometry would contain self-contradictions. Now if the parallel axiom were deducible from I, II, IV, V, we should be able to obtain the proposition that through a point C there is one and *only* one "line" which does not meet the "line" AB. It is plain at once that there are *many* "lines" (CD_1, CD_2, for example) that do not meet AB. The proof is therefore complete that III cannot be deduced from I, II, IV, V.

It was generally supposed[1] till the researches of Peano and Hilbert became known, that even though this kind of analysis could be applied to the parallel axiom, there might be other axioms to which it would not apply. It has by this time, however, been extended to all the axioms both of arithmetic and geometry. The mental images that are applied to the words "point" and "line," etc., in the bizarre mathematical sciences that have been used for this purpose vary from the letters of the alphabet to more or less complicated mathematical curves. The possibility is also recognised of using different mental images in the same science. For example, a distortion can be conceived to be applied to space in such a way that

[1] Cf. Poincaré, *Nature*, Feb. 25, 1892; Russell, *The Foundations of Geometry*, Introduction, p. 6, 1897, Cambridge, University Press.

all the lines are bent without altering their mutual relations. It is evident that if we think the geometrical relations in terms of the bent lines our images are changed without affecting the form of the axioms or the method of deduction. Theoretically, at least, the deductions could be made without any reference to their content by the use of a ratiocinative calculus like that of Peano or a Jevons logical machine.

The essential point is the recognition of the processes of logic, as separate from the mental imagery of the "elements." For this reason it is perhaps well to use the word "symbol," instead of "element" and "relation" as that, in the formal process, which answers to a basal concept of a science. The symbols of Hilbert's science, accordingly, are "points," "lines," "between," etc. The symbolic point of view also makes it possible to state in simple language what is meant by a definition.

Theoretically, all the propositions of a mathematical science can be stated in terms of the fundamental "elements" and their relations. As a rough example—we should never need to speak of "circles" but only of "sets of points in a plane equally distant from a given point." It is however convenient to introduce the term "circle" by a definition. Again, in arithmetic we may have the *definition*, $3+1=4$. In general, we mean by a definition an agreement that permits us to substitute a simple term or symbol for more complex terms or symbols. The only symbols that are undefined are the basal elements.

The question immediately arises, is it perhaps possible to define some of the elements in terms of the other elements? In that case our system of assumptions is clearly not as simple as possible, even if no one of the axioms is deducible from the others. We have therefore, in addition to the problem of determining a set of independent axioms, the analogous problem of determining an irreducible set of elements, i. e., a system of elements such that no one of them can be defined in terms of the others.[1]

The two problems are evidently interrelated, and Hilbert's geometry furnished a good example of that fact. Axiom I, 3 reads as follows:

I, 3: Three points A, B, C, not situated in the same straight line, always completely determine a plane α. We write $ABC=\alpha$.

This axiom was stated by Prof. F. Schur[2] of Karlsruhe to be deducible from the rest, but Professor E. H. Moore of Chicago, in the paper cited below, proved that such a statement is incorrect under the literal interpretation of Hilbert whereby a

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[1] This problem has been attacked and stated in a general, though somewhat different, form by Professor A. Padoa of the University of Rome. See *Bibliothèque du Congrès International de Philosophie, III. Logique et Histoire des Sciences*. Page 309, 1901. The method he proposes seems hardly adequate.

[2] Schur, "Ueber die Grundlagen der Geometrie," *Mathematische Annalen*, Vol. LV. (1901), pp. 265–292.

plane is made one of the undefined elements. The symbol "plane" is capable of definition in terms of "point" and "line," but unless this definition is admitted the axiom I, 3 is not a consequence of the other axioms. We thus have at hand a case showing how a system of axioms may be non-redundant while the system of elements is not irreducible.

It is along this direction that the severest criticism of Hilbert's work can be made. While his axioms are in the main independent, his system of elements is far from irreducible. In the axioms of the groups I and II there are three elements, points, lines, and planes, and two relations, represented by the phrases "are situated" and "between." It may be here stated, leaving the proof for a more technical article, that all these elements and relations can be defined in terms of "points" and "betweenness."[1]

Hilbert himself defines the relations of groups III and V in terms of the other relations. But he does not make use of the fact pointed out some twenty years ago by Klein,[2] that the congruence relation of group IV (which amounts to the same thing as rigid motion) can also be defined.

With respect to the congruence axioms, Hilbert makes[3] a curiously misleading statement:

> "We shall show the independence of the axioms of congruence by demonstrating that axiom IV, 6 . . . . cannot be deduced from the remaining axioms I, II, III, IV, 1–5, V, by any logical process of reasoning."

If we agree that congruence is an *element* it is obvious without further proof that the axioms of IV cannot be deduced from I, II, III, V, because congruence is not mentioned in I, II, III, V. What Hilbert really does, however, is to exhibit a mathematical science in which I, II, III, V are satisfied, and in which there is given a definition of congruence that verifies IV, 1–5, without verifying IV, 6. The effect of this is merely to demonstrate that a certain relation has the first five without the sixth property of congruence. The possibility still remains that by means of a suitable definition all the propositions of IV can be logically deduced.

The independence of his axioms was not fully investigated by Hilbert himself, but further research has revealed only one axiom which is capable of being deduced from the other axioms if the elements are retained precisely as Hilbert gave

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[1] For other ways of reducing to two the number of "elements" see Padoa "Un nouveau système de définitions pour la géométrie euclidienne." *2d. congrès international des mathématiciens*, 1900, p. 353. Reference is there made by Padoa to related work of Pieri.

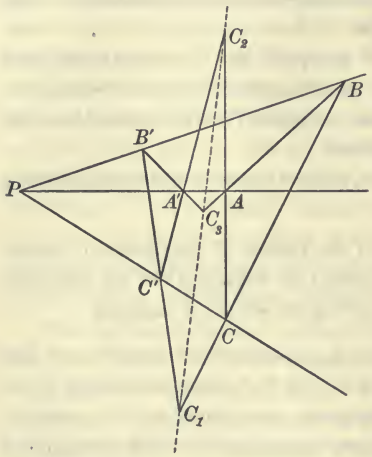
[2] Klein, *Math. Ann.*, Vols. IV., p. 573, and VI., p. 271 (1871–1873). It is important to add that the definition of congruence is not unique in the same sense as is the definition of "plane." In other words, by the Klein definition, rigid motion is a special case of a more general kind of "transformation of space."

[3] Art. 11, p. 32 of the translation.

them. This is axiom II, 4, the discovery of whose redundance was made a little over a year ago by Professor Moore.[1]

It is important to remark after the criticisms just cited that the imperfections of his axioms need not impair the importance of Hilbert's contribution to geometry. His work on axioms, indeed, can hardly be called more original or elegant than that of the Peano school in Italy. He has, however, by an attractive form of presentation drawn the attention of the entire mathematical world to one of the most fertile fields of investigation both for the technical mathematician and for the philosopher.

Besides this, Hilbert has extended the scope of his investigations so as to apply to any theorem whatever and not merely to the axioms. Take for example the famous theorem of Desargues:



> If two triangles are so situated in a plane that the lines joining their corresponding vertices AA', BB', CC', meet in a point P and the corresponding sides AB, $A'B'$, etc., meet in three points, C_1, C_2, C_3; then C_1, C_2, C_3 are collinear.

This theorem evidently has not to do with the metrical properties of the triangle. It becomes obviously true if the two triangles are not in the same plane, for then the corresponding sides can meet only in the line of intersection of the two planes. Nevertheless the theorem, when the two triangles are in the same plane, can *not* be demonstrated in a non-metrical way unless a construction is used which involves points outside the plane of the two triangles. This fact had long been suspected but never, before Hilbert's time, proved. The method of proof is an extension of that used to prove the independence of an axiom. A mathematical science is exhibited in which all the non-metrical axioms about the plane are valid, but in which it is not assumed that there are points outside the plane. In this mathematical science[2] the Desargues

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[1] E. H. Moore, "On the Projective Axioms of Geometry," *Transactions of the American Mathematical Society*, Vol. III., p. 142, January, 1902. A somewhat simpler proof, due to Mr. R. L. Moore, was published in an article on "The Betweenness Assumptions," *American Mathematical Monthly*, April, 1902.

[2] A simpler example of a non-Desarguean science than that of Hilbert is given by Dr. F. R. Moulton, *Transactions of the American Mathematical Society*, Vol. III. (1902), p. 192.

proposition is not a valid theorem, and therefore cannot be deduced from the axioms mentioned.

The extension of this method to the Desargues theorem and to many others is. I believe, the main achievement of Hilbert and of his students. In a sense it is the final extension to geometry of a tendency that has been powerful in the realms of analysis for the last half century. This is the desire, on the one hand, for perfectly rigorous logic in demonstration, and on the other hand to state theorems in the form of necessary and sufficient conditions.

A necessary and sufficient statement is of this form: "If A, then B, and if B, then A." Both the direct statement and the converse of a theorem are to hold. Stated in this language, the problem of the foundations of geometry is to find a system of axioms that is necessary and sufficient for geometry,—necessary, in that no axiom can be dispensed with, and sufficient for the deduction of the whole system of geometrical knowledge. In like manner the basal elements are to be necessary and sufficient for the definition of every other symbol of the science. The investigation of each theorem ought to be such that we can say that 'axioms a, b, c are necessary and sufficient for the validity of theorem D.' Finally, of each definition we should like to say that it is sufficient to determine the thing defined, whereas each symbol entering into it is necessary for such determination. The formulation of a science with this degree of necessity and sufficiency is the ideal of the investigators of the foundations of geometry.

OSWALD VEBLEN.

THE UNIVERSITY OF CHICAGO, December 1, 1902.

BOOK REVIEWS.

BABEL AND BIBLE. A Lecture on the Significance of Assyriological Research for Religion. Delivered before the German Emperor by *Dr. Friedrich Delitzsch*, Professor of Assyriology in the University of Berlin. Translated from the German by Thomas J. McCormack. Profusely illustrated. Chicago: The Open Court Publishing Company. London: Kegan Paul. Trench, Trübner & Co., Ltd. 1902. Pages, 66. Price, 50 cents net (2s. 6d. net).

The German Oriental Society has been making extraordinary and praiseworthy efforts of late to direct the attention of their government to the cultural importance of the excavations now being conducted in Mesopotamia and to induce it to grant generous subsidies for the further prosecution of this work by German scholars. The activity of Germany in these explorations has not been so great as that of England or France, and the measures referred to have been taken in order that the Fatherland might not lag behind in the international competition in practical Assyriology. Lectures were accordingly instituted for arousing popular as well as governmental interest in the work of Babylonian exploration, and were afterwards published in a series entitled *Der Alte Orient*; their authors are such men as Delitzsch, Winckler, Wiedemann, Zimmern, etc.

Of all these lectures that which excited the most widespread attention was one on "Babel and Bible" which Dr. Friedrich Delitzsch, one of the greatest leaders of Assyriological research, delivered in January, 1901, before the Emperor of Germany, at a regular meeting of the Oriental Society, and which he was specially invited to deliver a second time before the Emperor in the Royal Castle at Berlin. The lecture was subsequently published with profuse illustrations by Hinrichs of Leipsic, and it now appears in an English translation. The American publishers have increased the number of illustrations of the German edition, and have had them greatly enlarged. The lecture is a graphic and glowing popular *résumé* of the influence which Assyriological research has exerted on the interpretation of the Bible, and presents in succinct form a general view of Assyrian and Babylonian history, art, literature, and civilisation. There is now no excuse for any one's remaining unacquainted with the significant and astounding work which is being

done in the Orient, or for remaining blind to the light which this work has thrown on the entire field of early history. It is a fascinating subject, and Dr. Delitzsch's lecture has portrayed it at its best.

DIE BABYLONISCHE KULTUR IN IHREN BEZIEHUNGEN ZUR UNSRIGEN. EIN VORTRAG. Von *Hugo Winckler*. Leipzig: J. C. Hinrichs'sche Buchhandlung. 1902. Pages, 53. Price, M. 80.

Prof. Hugo Winckler of Berlin, a colleague of Prof. Friedrich Delitzsch, condenses in a short lecture of fifty-three pages the main facts known about Babylonian civilisation. He finds that Babylonian views have dominated the development of mankind in Greece and Rome during the Middle Ages, and are to a great extent preserved even to-day. This is especially true in mathematics and astronomy, in the names of the months, of the zodiac, and in popular expressions. Even the festivals of the ancient Babylonians are still continued among us under other names; and finally, our folklore can be rediscovered in the ancient legends and religious notions of those nations who dwelt thousands of years before us in Mesopotamia. P. C.

DIE GESETZE HAMMURABIS, KÖNIGS VON BABYLON, UM 2250 V. CHR. Das älteste Gesetzbuch der Welt. Uebersetzt von *Dr. Hugo Winckler*. Mit einer Abbildung des Steindenkmals. Leipzig: J. C. Hinrichs'sche Buchhandlung. 1902. Pages, 42.

This pamphlet, published by the *Vorderasiatische Gesellschaft*, is a German translation of an ancient stone slab containing the laws of Hammurabi, which is one of the most interesting documents of old Babylonian history ever recovered in the Orient. Hammurabi is the Biblical Amraphel mentioned in Genesis xiv. as a contemporary of Abraham and King of Shinar. He was one of the greatest kings of Babylon, a reformer and law-giver. After a period of great unrest, he restored order and re-established a stable condition of society. His laws form a landmark, not only in the history of Babylon, but in the history of mankind. They are more than 700 years older than the laws of Moses, according to the orthodox tradition, supposing the latter to be given in 1500 B. C.

Hammurabi flourished about 2250 B. C. The remarkable stone on which the inscription is recorded represents King Hammurabi in the presence of his god (the sun-god of Sippar), who communicates to him the laws which are codified in the mooted inscription deciphered for the first time by Father V. Scheil.

It was customary in ancient times for conquerors to transfer statues of gods and other significant monuments to their own capital and to replace the original inscription by a proclamation of their own triumphs. Our stone suffered a similar fate, but by good fortune the text of the inscription was saved. Five lines only are erased, and the victor's name does not appear on it. Moreover, even these five

missing lines have been restored from a copy of the laws of Hammurabi that was recovered from the library of Assurbanipal.

The contents of Hammurabi's laws are remarkable for their fairness, their humane principles, and their detailed accuracy. The inscription begins with a personal enunciation of King Hammurabi; he proclaims that he owes his government and success to the grace of the gods, and promises to rise over mankind as Shamash the sun-god does over the earth. His purpose is to protect the weak ones, to destroy evil doers, and to procure justice to every one. The law book contains 282 single statements, and deals with the questions of practical life,—unjust accusations, marriage relations, contracts, rent, the regulation of inheritances, regulations of the market, and similar ordinances. P. C.

THE CREATION STORY OF GENESIS I. A Sumerian Theogony and Cosmogony. By *Dr. Hugo Radau*. Chicago: The Open Court Publishing Company. London: Kegan Paul, Trench, Trübner & Co., Ltd. 1902. Pages, vi, 70. Price, Boards, 75 cents net (3s. 6d. net).

The greater part of this booklet appeared in *The Monist* for July, 1902. It considers the creation story of the first chapter of Genesis in the light of the oldest sources at our disposal, viz., the Sumerian cosmogony and theogony, of which the Biblical creation story of the Priestly School is a redaction. For having criticised and eliminated the mythical elements of the Sumerian tradition, P. is called by Dr. Radau "the first Higher Critic." Dr. Radau, in explaining certain attributes of the gods, was compelled to touch briefly upon the Sumerian cosmology, of which he has given a new representation. He also makes reference to the Arabian Pantheon. The little book is apt to appeal only to specialists and Old Testament and comparative Semitic research.

HYMNS OF THE FAITH (DHAMMAPADA). Being an Ancient Anthology Preserved in the Short Collection of the Sacred Scriptures of the Buddhists. Translated from the Pâli by *Albert J. Edmunds*. Chicago: The Open Court Publishing Company. London: Kegan Paul, Trench, Trübner & Co., Ltd. 1902. Pages, xiii, 110. Price, $1.00 (4s. 6d. net).

This celebrated and ancient anthology of Buddhist devotional poetry was compiled from three sources: (1) The utterances of the Buddha and his disciples; (2) From early hymns by monks; and (3) From popular poetic proverbs of India. It is the Buddhist *Imitation of Christ*, and constitutes one of the noblest of the world's religious expressions. Its fame relieves us from commenting upon the nature of its contents; the eloquent words of the translator, Mr. Edmunds, best characterise it. He says:

"If ever an immortal classic was produced upon the continent of Asia, it is this. Its sonorous rolls of rhythm are nothing short of inspired. . . . No trite ephemeral songs are here, but red-hot lava from the abysses of the human soul, in one out of the two of its most historic eruptions. These old refrains from a life

beyond time and sense, as it was wrought out by generations of earnest thinkers, have been fire to many a muse. They burned in the brains of the Chinese pilgrims, who braved the blasts of the Mongolian desert, climbed the cliffs of the Himâlayas, swung by the rope-bridge across the Indus where it rages through its gloomiest gorge, and faced the bandit and the beast, to peregrinate the Holy Land of their religion, and tread in the footsteps of the Master. Verses were graven on the walls of august temples at the command of Hindû emperors who abolished capital punishment, mitigated slavery, and established hospitals for men and animals, under the sway of this marvellous cult; and by Ceylon monarchs whose ruined reservoirs, as large as lakes, astonish us among the wonders of antiquity. And to-day, after twenty centuries of Roman and Christian culture, they have won the admiration of Europeans and Americans in every seat of learning, from Copenhagen to the Cambridges, and from Chicago to St. Petersburgh."

Mr. Edmunds has given us a very literal translation, but he has also had a literary ideal in view and sought by using an archaic and poetic style "to convey some flavor of the original" to his readers. While he remarks that it is "too ambitious a wish" to hope to naturalise in English this Buddhist holy writ as the King James Version has naturalised the Christian, an unbiassed critic can only say that he has contributed much toward this end. In this little book a living knowledge of the main Buddhistic doctrines is placed within the reach of every reader.

SUR LES PRINCIPES FONDAMENTAUX DE LA THÉORIE DES NOMBRES ET DE LA GÉOMÉTRIE. Par *H. Laurent*. Paris: C. Naud, Publisher. Pages, 68 Price, 2 francs.

In this number (No. 20) of the admirable scientific series called *Scientia*, devoted to the discussion of the burning questions of contemporaneous research, the distinguished French mathematician M. Laurent has considered the bases of the theory of numbers and of the theory of space. M. Laurent rejects axioms and begins with hypotheses. "An axiom," he says, "is a proposition which atavism, education, and the authority of our teachers have obliged us to accept as true without critical examination." His hypotheses are: "(1) I reason correctly (the hypothesis of all reasoning); (2) Quantity is to be defined (I suppose that quantity exists); (3) There are quantities susceptible of being divided into as many equal parts as one wishes (I shall define division into equal parts); (4) When a quantity increases or diminishes continuously without becoming larger or smaller than a fixed quantity it has a limit." "A truth is a plausible hypothesis or a logical consequence of non-contradictory hypotheses."

On this small number of hypotheses he seeks to found the theory of numbers. His point of view is utilitarian as distinguished from the æsthetic point of view of Tannery, Méray, and Cosserat. His conclusions he thinks to be just as simple as, and certainly more accessible to young minds than theirs. He is averse to their disinclination to base the theory of numbers on the consideration of quantity, and

he remarks that since mathematics is a science having for its aim the study of the exact and necessary relations of magnitude, of the form and position of the objects accessible to our senses, therefore the above-named gentlemen are pursuing not mathematical but metaphysical researches. For them pure mathematics is an exercise in logic; for M. Laurent its object is the study of quantities with the help of numbers. Thirty pages of the work are devoted to the consideration of numbers and thirty-eight pages to that of pan-geometry. He concludes that the plane is an arbitrary surface, or rather that geometry could be taught without defining a plane but by merely calling it an arbitrary surface of which it is impossible to give a precise definition. Geometry is a physical and experimental science,—a language competent to co-ordinate facts, or rather *appearances*, and indifferently Euclidean or non-Euclidean. The Euclidean geometry is that which appeared most simple to the brain of our ancestors. It would not be astonishing if there existed intelligent beings on the planet Mars with a non-Euclidean geometry and with different ideas from ours regarding displacement without change of form.

ESSAYS ON THE THEORY OF NUMBERS. I. Continuity and Irrational Numbers. II. The Nature and Meaning of Numbers. By *Richard Dedekind*. Authorised Translation by Wooster Woodruff Beman, Professor of Mathematics in the University of Michigan. Chicago: The Open Court Publishing Company. London: Kegan Paul, Trench, Trübner & Co., Ltd. 1901. Pages, 115. Price, 75 cents.

The mathematical reading public unacquainted with German is under considerable obligation to Professor Beman for the present faithful rendering of these two celebrated essays of Dedekind. Modern logical views of continuity and arithmetic are largely based on the results which Dedekind and his contemporary, G. Cantor, furnished (the first of their essays was published in 1872), and it is good that these investigations should be made accessible to all readers in their original form. Furthermore, the German of these essays is not the easiest imaginable reading, and the interpretation of the forms of expression which Professor Beman has given and which has involved considerable study, will also be welcome to readers of German who are in the habit of purchasing but not perusing German books.

"In science," remarks Dedekind, "nothing capable of proof ought to be accepted without proof." But in laying the foundations of the simplest of the sciences, "viz., that part of logic which deals with the theory of numbers," this postulate has not been complied with. In saying that arithmetic (algebra and analysis) is a branch of logic, Dedekind by implication asserts that the number-concept "is entirely independent of the notions or intuitions of space and time . . . an immediate result of the laws of thought." His answer to the question of the nature and meaning of numbers is that "numbers are free creations of the human mind and serve as a means of apprehending more easily and more sharply the difference of things."

He continues in the preface to his essay of 1887: "It is only through the purely logical process of building up the science of numbers and by thus acquiring the continuous number-domain that we are prepared accurately to investigate our notions of space and time by bringing them into relation with this number-domain created in our mind. If we scrutinise closely what is done in counting an aggregate or number of things, we are led to consider the ability of the mind to relate things to things, to let a thing correspond to a thing, or to represent a thing by a thing, an ability without which no thinking is possible. Upon this unique and therefore absolutely indispensable foundation, . . . must, in my judgment, the whole science of numbers be established."

Such is the fundamental idea of Dedekind's thought. He succeeded by means of it in building up a continuous number-system which included not only rational numbers but also, and *necessarily*, irrational numbers. These memoirs can, as their own author remarks, "be understood by any one possessing what is usually called good common sense; no technical philosophic, or mathematical, knowledge is in the least degree required."

ELEMENTE DER STEREOMETRIE. Von *Prof. Dr. Gustav Holzmüller* in Hagen i. W. Vierter Teil, Fortsetzung der schwierigeren Untersuchungen. Mit 89 Figuren. Leipzig: G. J. Göschen'sche Verlagshandlung. 1902. Pages, xi, 311. Price, bound, 9.50 Marks.

HÖHERE ANALYSIS. Zweiter Teil. Integralrechnung. Mit 89 Figuren. Von *Dr. Friedrich Junker*, Professor am Realgymnasium und an der Realanstalt in Ulm. Zweite, verbesserte Auflage. Leipzig: G. J. Göschen'sche Verlagshandlung. 1901. Pages, 209. Price, 80 Pf.

PROJEKTIVE GEOMETRIE. In synthetischer Behandlung. Von *Dr. Karl Doehlemann*, Privatdozent an der Universität München. Zweite, vermehrte und verbesserte Auflage. Mit 85 Figuren. Leipzig: G. J. Göschen'sche Verlagshandlung. 1901. Pages, 176. Price, 80 Pf.

DARSTELLENDE GEOMETRIE. Erster Teil. Elemente; Ebenflächige Gebilde. Von *Dr. Robert Haussner*, Professor an der Universität Giessen. Leipzig: G. J. Göschen'sche Verlagshandlung. 1902. Pages, 192. Price, 80 Pf.

REPETITORIUM UND AUFGABENSAMMLUNG ZUR INTEGRALRECHNUNG. Von *Dr. Fr. Junker*, Professor am Realgymnasium und an der Realanstalt in Ulm. Mit 50 Figuren im Text. Leipzig: G. J. Göschen'sche Verlagshandlung. 1902. Pages, 130. Price, 80 Pf.

REPETITORIUM UND AUFGABENSAMMLUNG ZUR DIFFERENTIALRECHNUNG. Von *Dr. Fr. Junker*, Professor am Realgymnasium und an der Realanstalt in Ulm. Mit 42 Figuren im Text. Leipzig: G. J. Göschen'sche Verlagshandlung. 1902. Pages, 119. Price, 80 Pf.

The domain of pure elementary geometry was immensely extended by the researches of Poncelet, Chasles, Steiner, and Möbius, and the reaction which set in

during the nineteenth century against the purely analytical methods of the eighteenth has assumed so formidable proportions that the author of the first work above listed, Dr. Holzmüller, even intimates the *possibility* that analysis may at some future time be overtaken by geometry. He has himself been surprised at the simplicity of the methods and of the form of the results which he has reached in his purely geometrical developments without the assistance of the higher analysis, and many of his colleagues have joyfully recorded a like astonishment. It has not been the author's intention to render the calculus superfluous in the treatment of solid geometry, but merely to *systematise* the elementary methods, and to exhibit and apply them in the full extent of their new-born power, hoping in this way to obtain as many as possible new points of view for the subjects treated and to strengthen the student's powers of spatial visualisation. The present and last volume of this extensive and scholarly work on solid geometry presents the elements of the theory of certain moments of homogeneous point-systems, particularly static and centrifugal moments and moments of inertia; applies in their full generality the summation formulæ; gives stereometric and mechanical interpretations and visualisations of the above-mentioned moments for plane surfaces and curves; discusses the catenoid, Gauss's pseudo-spherical sphere; etc., etc.; the many subjects treated being too numerous to mention in detail. Elucidative historical and methodological remarks are interwoven in the text, all combining to make Holzmüller's work the most thorough and helpful existing treatise on the elements of solid geometry as developed without the use of the calculus. The publishers have done their utmost to render the work serviceable. Good indexes have been added.

The remaining five works listed at the head of this notice belong to the very cheap and admirable series of little mathematical text-books called the "Sammlung Göschen." The little treatise on the integral calculus by Dr. Junker is, as we have had occasion to learn in detail, a concise and adequate presentation of the subject. It consists of ten chapters treating respectively of the integration of simple, rational, irrational, and transcendental differentials, of definite integrals, of the application of the integral calculus to geometry of two and three dimensions and to statics, and of the double integral and its applications, giving finally a brief discussion of ordinary differential equations. Dr. Junker has also compiled (see the fifth work above listed) a syllabus of the formulæ of the integral calculus and a collection of examples for practicing it. He has done the same for the differential calculus (see the sixth work above listed), which is issued as a species of supplement of his work on the differential calculus in this same series. These little books can be used independently of their companion works, inasmuch as in each case the formulæ precede the exercises, and illustrative examples are worked out at the beginnings of each section. They are also supplied with figures. Little knowledge of German is requisite to use these books profitably.

Dr. Doehlemann's book on *Projective Geometry* is intended for beginners who are just about entering on the study of modern synthetic geometry. The subject

has been attacked from different sides, not excluding that of metrical geometry, although of course the chief emphasis has been placed on constructive and visualising methods. The geometry of space is considered in connection with that of the plane. The figures are in two colors.

Dr. Robert Haussner, the author of the *Descriptive Geometry* in this series, is professor in the University of Giessen and the translator of Monge's celebrated *Géométrie descriptive*, which was the pioneer work of this very practical and useful branch of mathematics, and the inaugurator of the modern Renaissance of geometrical research. Dr. Haussner's work, while concise, is very comprehensive and a thoroughly modern presentation of its subject.

It will not be amiss to mention in this connexion that Göschen has also recently issued the first part of a *Multidimensional Geometry* by Dr. P. H. Schoute, of the University of Groningen, Holland. The book treats of linear spaces and the work will restrict its investigations to the geometry of Euclid. μ.

THE SCIENCE OF MECHANICS. A Critical and Historical Account of Its Development. By *Dr. Ernst Mach*, Professor of the History and Theory of Inductive Science in the University of Vienna. Translated from the German by Thomas J. McCormack. Second Revised and Enlarged Edition. With 259 Cuts and Illustrations. Chicago: The Open Court Publishing Company. London: Kegan Paul, Trench, Trübner & Co. 1902. Pages, xix, 605. Price, Cloth, $2.00 net (9s. 6d. net).

The appearance of the second edition of Dr. Ernst Mach's now famous work on the development of mechanics is coincident with a wide-spread revival of philosophical interest in the foundations and methods of the various exact sciences; and the translator of the present work remarks:

"Since the appearance of the first edition of the present translation of Mach's *Mechanics*, the views which Professor Mach has advanced on the philosophy of science have found wide and steadily increasing acceptance. Many fruitful and elucidative controversies have sprung from his discussions of the historical, logical, and psychological foundations of physical science, and in consideration of the great ideal success which his works have latterly met with in Continental Europe, the time seems ripe for a still wider dissemination of his views in English-speaking countries. The study of the history and theory of science is finding fuller and fuller recognition in our universities, and it is to be hoped that the present exemplary treatment of the simplest and most typical branch of physics will stimulate further progress in this direction."

The text of the present edition of the English translation contains the extensive additions made by the author to the fourth German edition published in 1901, and has been thoroughly revised throughout. The author's additions are considerable, occupying a space of more than seventy pages, the principal sections being those discussing Hertz's *Mechanics* and the concepts of mass, inertia, absolute

motion, etc. These elucidative remarks of the author will be found highly valuable by students of the philosophy and history of science, while the references to the recent literature in this department, which is very rich, will also be found helpful. The price of the book, which in the German is quite expensive, has been reduced, and the publishers have taken every measure to render the work attractive and accessible to the public for which it is intended.

VORTRÄGE ÜBER DESCENDENZTHEORIE GEHALTEN AN DER UNIVERSITÄT ZU FREIBURG IM BREISGAU. Von *August Weismann*. Mit 3 farbigen Tafeln und 131 Textfiguren. Jena: Verlag von Gustav Fischer. 1902. Pages, Erster Band, xii, 456. Zweiter Band, vi, 462.

After a long silence and after the smoke of the great controversy which ten years ago or more hung over the battle-fields of biology has entirely vanished, the name of Weismann again appears upon the literary horizon. There is a note of sadness in the present two volumes of lectures on the *Theory of Descent*. Its author remarks that "when a life which has been full of the joy that labor brings is nearing its end, a desire inevitably arises to put into symmetrical and harmonious form the main results of one's achievements, as a bequest to the generations to come." A painful affection of the eyes has greatly hindered his labors, and he feels uncertain whether time or strength will long be left him for the further improvement of his biological system. These have been the motives which have led him to the present publication. It is hoped that his apprehensions will not be fulfilled.

The work is a collection of lectures on general biology which the author delivered before a mixed audience of students of medicine and natural sciences. Weismann still stoutly maintains that, despite the opposition which they have encountered, his biological views of descent and heredity are essentially and fundamentally correct,—notably his assumption of the "determining" units of life (determinants) and their relation to the ids. Closely connected with the theory of determinants stands his theory of Germinal Selection (expounded some years ago in the pages of *The Monist*), without which, he claims, the great thought of the controlling influence of natural selection in the transmutation of living forms with the rejection of the unfit and the selection of the fit, would remain a torso, a tree without roots. The application of this principle of selection to each and every single element of the various categories of vital units, is, he states, the very gist and kernel of his biological views. It is the dominating thought of the lectures, that in which their significance centers. "It will endure," says Weismann, "even though everything else the work contains shall perish."

Whatever may be the opinion of critics on this point, none can gainsay that the picture of modern biological research, which the great inquirer has here unrolled, is one of great fascination and replete with instruction.

GRUNDRISS EINER GESCHICHTE DER NATURWISSENSCHAFTEN. Zugleich eine Einführung in das Studium der grundlegenden naturwissenschaftlichen Litteratur. Von *Dr. Friedrich Dannemann*. I. Band. Erläuterte Abschnitte aus den Werken hervorragender Naturforscher aller Völker und Zeiten. Zweite Auflage. Mit 57 Abbildungen zum grössten Teil in Wiedergabe nach den Originalwerken und einer Spektraltafel. Leipzig: Verlag von Wilhelm Engelmann. 1902. Pages, xiv, 422. Price, bound, 9 Marks.

The fact that the first edition of Dr. Dannemann's *Elementary History of the Natural Sciences* has been exhausted within a space of five years is evidence of the great educational value of the volume. To those who are unacquainted with the nature of the work, we may say that it consists of two volumes, the first of which, now in its second edition, gives specimen classical investigations from all the sciences, in the words of the original discoverers and authors; for example, selections from Archimedes, Copernicus, Galileo, Kepler, Pascal, Guericke, Newton, Huygens, Celsius, Kant, Franklin, Cuvier, Faraday, Liebig, Darwin, Schönbein, and Hertz. The little articles are accompanied by neat fac-simile reproductions of the cuts and pictures of the originals from which the extracts were taken. Dr. Dannemann's work, with its companion volume, which is a connected historical narrative of scientific discovery, cannot be too highly recommended.

DICTIONARY OF PHILOSOPHY AND PSYCHOLOGY. Including many of the principal conceptions of Ethics, Logic, Æsthetics Philosophy of Religion, Mental Pathology, Anthropology, Biology, Neurology, Physiology, Economics, Political and Social Philosophy, Philology, Physical Science, and Education, and giving a Terminology in English, French, German, and Italian. Written by many hands and edited by *James Mark Baldwin*, Ph. D. (Princeton), Hon. D. Sc. (Oxon.), Hon. LL. D. (Glasgow), Stuart Professor in Princeton University, with the co-operation and assistance of an international board of consulting editors. In three volumes with illustrations and extensive bibliographies. Vol. II. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1902. Pages, xii, 892. Price, $5.00 net.

The text of Professor Baldwin's *Dictionary of Philosophy and Psychology* is completed with the present volume, which contains helpful general indices of Greek, Latin, German, French, and Italian philosophical terms. The editor, in thanking correspondents and reviewers for bringing minor errors in Vol. I. to his notice, remarks that the book has been misjudged on two points only. His reviewers fell heavily upon the bibliographical portions of the *Dictionary*, and the editor parries their onslaughts with the remark that the treatment of biography was not "more than the proverbial 'part of a loaf'; it was a question, indeed, of part of a loaf or no bread." He also repudiates the insinuation that Greek and Latin philosophy have been slighted. He has nothing to say about the inclusion of a hodgepodge of irrelevant theological, juridical, and other terms. We opine that in this

case, continuing the baker's simile, it was a question of pumpernickel or no pumpernickel.

The present volume contains some articles of considerable length, like those on the "Nervous System," "Syllogism," and "Vision." We gave in *The Monist* for April, 1902, a rather lengthy general review of the character and tendency of Professor Baldwin's *Dictionary*, and it now remains for us merely to emphasise again its general usefulness and value as a work of reference, which it certainly possesses in spite of the many inconsistencies in the plan of its construction. A third volume of bibliography is still to appear, and it is to be hoped that this will prove an indispensable boon and guide to students, amidst the mountainous literature which has grown up around philosophical and psychological subjects.

GRUNDZÜGE DER PHYSIOLOGISCHEN PSYCHOLOGIE. Von *Wilhelm Wundt*, Professor an der Universität zu Leipzig. Fünfte völlig umgearbeitete Auflage. Zweiter Band. Mit 153 Abbildungen im Text. Leipzig: Verlag von Wilhelm Engelmann. 1902. Pages, viii, 686. Price, bound, 16 Marks.

OUTLINES OF PSYCHOLOGY. By *Wilhelm Wundt*. Translated with the Coöperation of the Author by Charles Hubbard Judd, Ph. D., Instructor of Psychology, Yale University. Leipzig: Wilhelm Engelmann. London Agents: Williams and Norgate. New York Agent: Gustav E. Stechert. 1902. Pp., xxii, 390. Price, $2.00 net.

We are glad to record the appearance of the second volume of the fifth and fully revised edition of Professor Wundt's *Elements of Physiological Psychology*. This celebrated production has occupied a unique and commanding position in experimental psychology, and was for years the sole work from which students drew their knowledge and inspiration. The text has been subjected to thoroughgoing alterations, and the work thus seems destined to exert a powerful influence for a long time to come.

We also welcome the issuance of a second revised English edition of Wundt's smaller *Outlines of Psychology*. It has been translated from the German by Dr. Charles Hubbard Judd, instructor of psychology in Yale University. This edition has been made to include all the additions the author incorporated in the fourth German edition, which are considerable. The phraseology of the English translation has also undergone alteration, and the helpfulness of this exposition of the great psychologist's theories has thus been enhanced in many respects.

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THE MONIST

THE THEORY OF ENERGETICS AND ITS PHILOSOPHICAL BEARINGS.

THE theory of "Energetics" so called, first propounded by Rankine some fifty years ago, has been revived recently in Germany. The *Energetiker* have not been satisfied with their endeavor to formulate a new theory of physical science, but essay the field of philosophy as well. There is no name more eminent, or one which is more closely identified with this novel movement of thought than that of Ostwald. In his lectures on *Naturphilosophie* delivered in Leipzig during the summer of 1901, he gathered about him a number of enthusiastic admirers and followers, disclosing to them the mysteries of science and philosophy as made manifest in the universal solvent,—the concept of energy. In a letter which I have received from an acquaintance who has recently been in Germany, the attitude towards Ostwald in academic circles is aptly described as follows. "The men in philosophy fear his science, and the scientists fear that there is something in his philosophy."

His may be styled a philosophy without hypothesis, for such is his claim, that the system which he offers is founded solely upon observed facts, and that these facts of themselves form a compact system which needs no metaphysical speculation whatever in its construction.[1] He insists, moreover, that it is the physicist, and he alone, who is entitled to an opinion in matters philosophical; for he only is in possession of the facts, and facts alone have philosophical significance. There seems to be a strange fascination to

[1] *Naturphilosophie*, p. 181.

the physicist, and to the biologist as well, in the region of philosophy which lies so alluringly without the field of their specialties. Now and again, they look up with an eager and questioning wonder from the circumscribed area which bounds their tasks to the great world and the world-problems.

The claims of the *Energetiker* as expressed by Ostwald may be briefly summarised as follows:

If we put to ourselves the question, "Which is the most universal and comprehensive concept employed in scientific circles today, and the one to which all other concepts may be appropriately referred," we are constrained to confess that it is none other than the concept of energy.[1] By energy, moreover, is to be understood whatever is the result of work, or whatever may be transformed into work.[2] Thus when reduced to their lowest terms, the traditional concepts of metaphysics, that of substance and that of causation, may be more adequately and precisely expressed as varied manifestations of the fundamental concept of energy.[3] The concept of matter from this point of view becomes superfluous, for energy needs no substratum or vehicle to render it any more elemental in character, or any more intelligible.[4] The essential properties of matter may be more satisfactorily expressed under the concepts of *Form-energy* and *Volume-energy*. The *Form-energy* is that property of a body by virtue of which it is capable of maintaining its form, or it is that amount of energy which must be applied to the body in question in order to produce any deformation. The *Volume-energy* is defined as that amount of energy which is necessary in order to preserve the volume of a body, or to change it as a whole through the process either of contraction or expansion. When, for instance, we say that we feel a material thing, as we put our hand upon a book or a desk, it is really the experience of some changed form of our organism which we feel, and which is due to the manifestation of the energy induced by the grasp of the hand.[5] Aside, therefore, from the properties which may be expressed as forms of energy, matter remains

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[1] P. 152. [2] P. 159. [3] P. 153. [4] P. 165. [5] Pp. 168, 169.

a pure abstraction. Matter, consequently, gives place to energy, and with the passing of matter that most perplexing of all philosophical difficulties, the transition from physical to psychical phenomena, becomes immensely simplified. For, as Ostwald puts it, the concept of energy seems to be far more *geistig* than that of matter.[1] It is possible to conceive more readily of psychical energy as a kind of transformed physical energy, than to conceive of the essential coördination of matter and of mind. The nervous energy into which the physical energy of the external stimulation is transformed by the organs of sensation, seems to be one degree nearer the psychical energy. It is so near of kin at least that it is possible to regard its peculiar function to be that of liberating the stored energy of the brain which manifests itself in the varied wealth of psychical phenomena.[2] The transition, therefore, to this central nervous energy with the unique characteristic of consciousness attached to its manifestations, is relieved of many, if not all, of its traditional difficulties.

As motion is to be regarded as the differentiating characteristic of kinetic energy, so also consciousness may be regarded as the differentiating characteristic of this central energy of the brain.[3] When we come to the more complex forms of this central energy, as manifested in the phenomena, for instance, of volition, we find that the resulting activity in all cases may be referred to some liberating cause in the form of nervous energy acting upon the stored volitional energy within the central organ.[4] This general position as thus briefly outlined is fortified by a reference to three analogies, which by the way is a form of proof presenting rather shifting ground upon which to construct so important a doctrine as is the main contention of Ostwald.

1. It is insisted that there is no more difficulty in effecting the transition from the various forms of physical energy external to the organism to the nervous energy within it, than the subsequent transition from this nervous energy to that unique form of nervous energy which is centrally liberated and which is attended by con-

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[1] P. 148. [2] P. 392 f. [3] P. 396. [4] P. 426.

sciousness. The one transition, it is affirmed, is wholly analogous to the other.[1]

2. The question may be suggested at this point, Why is not all nervous energy and indeed all forms of energy whatsoever attended by consciousness? Ostwald answers this by the following analogy:

As a few crystals, not all, give manifestations of electrical energy under pressure, so also not all forms of energy are attended by the manifestation of consciousness, but only in the unique case of the central energy of the nervous system.[2] This relieves Ostwald of the necessity of correlating consciousness with all forms of energy whatsoever.

3. He adduces a third analogy as follows: As a relay battery in electricity produces its stored energy in such a manner that the resulting effect is out of all proportion to the liberating cause, so also the centrally stored energy gives results often seemingly incompatible with the nervous energy which has acted as its exciting and liberating cause.[3] Such being the statement in general of the position maintained by the *Energetiker*, particularly as formulated by Ostwald, let us proceed to an examination of its fundamental and essential claims.

The theory, as at present developed, has not yet substantiated its claims in the field of physics pure and simple, setting aside entirely all consideration of its claims in the field of philosophy. For instance, Boltzmann has pointed out several mathematical incongruities in Ostwald's theory which would indicate that it is not wholly free from some mathematical presuppositions at least which are precariously uncertain. The philosophy without hypothesis is thus challenged at the start, and in reference to its fundamental basis.[4]

Boltzmann also draws attention to the fact that Ostwald grounds his theory in a concept of energy which he regards as elemental; to be accepted simply, and as impossible of reduction to any lower terms. And yet the mathematical expression of energy

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[1] P. 396. [2] P. 397. [3] P. 392 f.

[4] *Annalen der Physik und Chemie*, N. F. Band 57, P. 46 f.

is that of $\frac{1}{2}mv^2$, one half the mass into the square of the velocity. But when asked to define the meaning of mass, Ostwald gives its definition in terms of kinetic energy. And we find ourselves confronted by the circle,—energy defined in terms of mass, and mass in turn in terms of energy.

Moreover, in reference to the concept of Volume-energy, Planck has drawn attention to the fact that the *Energetiker* have employed an integral which involves them in certain mathematical difficulties. This integral is $\int pdv$, where p is the pressure, and v the volume of a gas. Now any given physical energy which passes through a cycle of changes and returns to its initial state must regain its original value without a loss of energy, and this the mathematical symbols and processes should indicate. But this particular integral indicates that a change in the quantity of energy occurs through the process of a return to its initial state. Planck concludes that "there is in general no significance whatsoever in the term, the Volume-energy of a gas, in the sense of its designating any physical quantity which can be reckoned with mathematically."[1]

In general it may be said that the theory of energetics applies only to reversible processes, that is, wherein the returning cycle of changes shows no loss of available energy, but that wherever there is such a loss it fails of describing adequately the phenomena in question. As Mach has put it, "The principle of energy is superfluous in reference to a quantity of heat that can no longer be transformed into mechanical work."[2]

Such a state as Mach describes is an excellent illustration of an irreversible process. The theory of energetics, therefore, seems to overlook the second law of thermo-dynamics which expresses the tendency of all energy to become transformed into unavailable states.

Although the foundations of this theory of energetics are by no means grounded upon a secure mathematical and physical basis,

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[1] *Annalen der Physik und Chemie*, N. F. Band 57, P. 72.

[2] *The Monist*, Vol. V., p. 49. *Popular Scientific Lectures*, 3rd ed., p. 178.

let us suppose, however, for sake of argument that its mathematical ground, expression, and applications have been proved in a highly satisfactory manner; nevertheless, it by no means follows that the dark places of philosophy are illumined by its light to the extent as claimed for it by Ostwald. Let us undertake some critical considerations of his position in this regard. It may be of assistance to us in getting our bearings in this discussion to recall a statement of Poincaré to the effect that whenever any physical system has been portrayed by means of some mechanical expression of its interrelations and interactions, then also an indefinite number of other mechanical expressions is possible which will as adequately embrace the entire situation and as completely fulfil its tests and conditions. Whether we agree with him in this statement, is not to the point. For our present purpose it serves at least to emphasise the point, that any mechanical explanation whatsoever, whether the traditional theory or the new theory of Energetics, does not in any sense purport to give an exposition of the real significance of the phenomena which it describes. If therefore the theory of Energetics does not and can not express the essential nature of physical phenomena, how then can it reveal to us the significance of psychical phenomena and their relations to the physical?

Coming, therefore, to this main problem, the transition from the physical to the psychical, Ostwald's theory does not touch in the remotest manner the outstanding difficulty which is involved. His theory is based essentially upon the principle of the conservation of energy which renders possible the correlation of the various forms of physical energy as regards their quantitative equivalence. But when it is proposed in a like manner to correlate the nervous energy of the bodily organism with the so-called psychical energy, it must be borne in mind that there is this essential difference, the latter correlation is a qualitative one while the former is quantitative. The insidious influence of analogical suggestion in directing the trend of Ostwald's thought has proved in this connection most misleading. The theory of energetics is primarily a means of expressing quantitative equivalence; but psychical phenomena not

merely elude all attempts to express their quantitative equivalence in respect to the nervous phenomena accompanying them, or in respect to the more remote physical phenomena which act as the external nerve stimuli, but it is impossible to express them in terms of any quantitative nature whatsoever. Ostwald says, "We start with a datum which embraces only that which can be proved and demonstrated through experiment and measurement."[1]

This statement occurs in connection with his attempt to ground his theory solely upon observed physical phenomena, and in order to express his disdain of hypothesis and vague speculation. If, however, in the premises there is only the measurable, how can there be in the conclusion that which wholly transcends all measurement? It is impossible to correlate a given quantity of brain-energy with a concomitant variation as regards the quality of any mental state whatsoever.

Ostwald insists that the chemical changes in the central organ of the nervous system cause a liberation of the stored psychical energy.[2]

The very phrase which is used, "stored psychical energy," implies something of a physical nature as its vehicle, and the transition from the liberating energy which is chemical to the resulting psychical phenomena remains as much a mystery as before. Even though the liberating energy may be conceived as reduced to an infinitesimal amount, it is still physical, and the liberated energy is psychical. The general expression of energy in terms of $\frac{1}{2}mv^2$ represents its essence under space and time-conditions. Ostwald himself states that "energy has play only in portions of space in which mass and gravity are present together.[3]

But mental phenomena present no such characteristics in themselves. It is impossible to think them under such categories. Therefore this unique manifestation of consciousness which, it is alleged, must be regarded as the differentia of the central nervous energy, is either the same in kind as that of nervous energy or it is not.

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[1] P. 181. [2] P. 377. [3] P. 191.

If it is the same, it can be known only under space and time-conditions, and is consequently a disguised form of mass and velocity relations.

If, on the other hand, it is not the same, it falls outside of the concept of energy altogether and remains unexplained from the point of view of the *Energetiker*.

Aside from all representation by means of any formulæ, the concept of energy conceived as a form of work does not express the fundamental nature and essential characteristics of psychical phenomena. Not even through the wildest flight of the imagination or through the most grotesque phantasy is it possible to represent thought as a form of work, or as capacity for work, or as anything of that sort.

Again, in the more complex form of volitional energy, Ostwald finds a further intimation of the transformation of physical into psychical phenomena, for he insists that psychical energy in the form of volition producing physical effects in the bodily organism and through the movements of the body upon the external world is more nearly akin to the concept of work or to that of the capacity for work. In support of this position, Ostwald treats at length of the sympathetic exhaustion induced throughout the entire nervous system whenever an excessive strain is put upon the will, and how the effort of the will in turn becomes sensitive to all excessive bodily fatigue.[1] However, while it is true that volitional phenomena and bodily phenomena are most intimately connected, this by no means proves that the essential nature of the one in any way expresses the essential nature of the other. The difficulty here is no other than that which confronts us in the transition from the nervous energy of the sense-organs to the accompanying consciousness, though it be of the most elementary kind. It presents only a more highly developed form of the relation which obtains between the physical and the psychical.

Moreover, if we compare the physical world as a whole, with the world of thought as a whole, we will find that the course of

[1] P. 247 f.

evolution is not the same in each. The development of the physical world is attended with a decrease of available energy, or as it is also expressed, by an increase of the so-called entropy. Whereas the world of thought on the other hand is constantly accumulating its store of available energy with each succeeding generation. Thought energy must therefore partake of an entirely different kind of being than that of physical energy. The stored thought of mankind conserved, for instance, in the great libraries of the world is evidently in a form far removed from anything which the concept of energy even in its potential state can possibly represent. Nor do we find it conserved in any conceivable form of energy amidst the traditions and institutions of a people.

Ostwald appears, moreover, in Kantian disguise when he insists that, at the last analysis, knowledge must be regarded as purely subjective, and that the phenomena of the external world become intelligible only through the fundamental forms which thought imposes upon them; and, therefore, inasmuch as the total content of knowledge may be conceived merely as varied manifestations of one and the same form of energy, it must follow that the essential nature of the thought which comprehends it is of the same energetic essence. Thus thought and the content of thought are identical.[1] It would seem that Ostwald has here wandered far afield from the primary ideal of a philosophy without hypothesis, which should be composed wholly of facts, swinging clear of all speculative obscuration and dogmatic construction. This is only another phase of that transition from the physical to the psychical which appears to be as easily effected by Ostwald the metaphysician as by Ostwald the physicist.

In this connection, also, Ostwald explains the consciousness of the personal identity of the subject or the ego as due to "the continuity of experiences in one brain, or in one mind."[2] If this continuity of experience is to be accounted for by one brain, that is, by the central nervous activity connecting and correlating the totality of manifold experiences into a systematic whole which is

[1] P. 394. [2] P. 411.

characterised by the self-consciousness of a personality looking before and after, then an absolutely extraordinary and impossible demand is made upon the brain, regarded solely as a physical organism.

If, on the other hand, this continuity of experience is provided for by the mind, that is by the subjective thought-centre, or ego, or psychical energy, or what you will, then its peculiar functions, both the elemental and the more highly developed, alike transcend any possible representation whatsoever by those fundamental properties of the concept of energy which forms the basis of Ostwald's system, and which is expressible in terms of mass and velocity, or in terms of work or capacity for work.

It is obvious therefore that if the primary concept of energy is so defined as to embrace psychical phenomena, we have no longer the simple concept of energy as understood and recognised in scientific circles or even among the *Energetiker* themselves; but if the psychical element does not occur in the original concept of energy, it can never be reached by any series of subsequent transitions or transformations, however many and complex they may be.

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KANT'S TREATMENT OF ANALYTIC AND SYNTHETIC JUDGMENTS.

EVERY one knows the place which Kant gave to the distinction between analytical and synthetic judgments and to the importance of proving the existence of *a priori* synthetic judgments, and hence I shall not enter here into any preliminary account of his position. I shall simply take for granted that it is understood, or can easily be ascertained if not understood. What I wish to do is to discredit the correctness of his views generally by showing that he had totally misconceived the problem of knowledge. That may appear a bold program to announce, but after trying the policy of humility in the study of Kant and finding that I was destined to perish in a bog and a wilderness if I continued to pay reverence to that court, I know no other deliverance than to issue a declaration of independence. This does not mean that no value can come from the study of Kant, but that, with due gratitude for the intellectual gymnastics involved in trying to find out what under the sun he meant by his system, I can treat him as the occasional cause of ideas that I might not otherwise have obtained. I confess, however, to a somewhat malicious desire to disturb the equanimity of those who so persistently cultivate a superstitious reverence for Kantian philosophy after the failure of a century's study and exposition to make anything intelligible out of his fundamental conceptions. I can understand how, after having discovered some philosophy in the process of studying Kant, one may wish to share the credit with him whom he wishes to treat as a master, but humility is no reason for sheltering one's own ideas under the shadow of a supposed great name, especially when one has to admit that

the fundamental conceptions on which that supposed great person based his system are false. There is no use in taking the keystone out of a man's arch and then insist that the arch itself will remain intact. You must put your own support in or abandon it as a poor piece of workmanship. This is especially true if the man, whose respect you are trying to sustain, himself insists that his system stands or falls with the doctrine which you reject. Now Kant made the existence of *a priori* synthetic judgments crucial to his theory of knowledge and would have been the first to abandon it if he had been shown that he had wholly misconceived the problem that he supposed himself to have solved.

I am aware that there has been much discussion of this question of Kant's distinction and the importance attaching to it according to his view, but I think that there may be some further analysis of the questions involved, though I have not had the time or opportunity to read all that has been said on the subject. I hope that I have some points that are new on it amid some that are old. I take it up because Kant insisted that his system depended upon it for its validity. If we succeed in discrediting his doctrine at this point it is apparent that the Kantian philosophy, on its own terms, is destroyed. It may seem all very well to differ with Kant in regard to the importance of his distinction, but you cannot do this without discrediting his judgment to that extent and so raising the question whether it is worth any more in the conception of the system as a whole. Whatever we think of Kant's imprudence or mistake in thus imperilling his system by the crucial question of *a priori* synthetic judgments it is certainly an *ad hominem* refutation of it to show that there are no such judgments, and after that it remains for those interested in accepting him as an authority to establish his idealism without the support which he made necessary.

I believe it was Schleiermacher who first called attention to the fact that any judgment might be regarded as either analytic or synthetic according to the point of view from which it is considered, but I do not know that he brought against the distinction the psychological considerations which I wish to produce here. I do

not mean to imply by the language "against the distinction" that it cannot be made at all, but that it has not the absolute character which Kant seems to have given it, and hence if it has not that absolute nature assumed, it is quite possible at least that a view can be taken of the question which nullifies its importance for the Kantian philosophy. If any judgment can be looked at as either of the two under conditions we have an equivocation to deal with which may affect the application of the *a priori* and limit it to the analytical aspect of the judgment.

It seems not to have occurred to Kant that "*Alle Körper sina ausgedehnt*" may be analytical only to the sense of vision and synthetic to touch, unless we assume that space is a "common sensible" having the same representative import to both senses, which it certainly has not. If we accept Berkeley's view of the origin of space-conceptions and that of the motor school, it might alter our way of stating the question, but it would not alter the relation which these two senses sustain to the issue. But if a doubt be raised about this contention it can hardly be raised about Kant's illustration of synthetic judgments. "*Alle Körper sind schwer*" may be synthetic to vision, but it is not synthetic to touch. In the latter it is analytic according to Kant's own conception of the case, as "*Körper*" to touch can mean nothing more than the resistance involved in "*schwer.*" To return then to his illustration of analytic judgments, if "*Körper*" be a tactual concept the "*Ausdehnung*" of vision is a synthetic characteristic, and can be analytic only on the assumption that the subject is also a visual product. Hence the question whether a judgment be analytic or synthetic depends on the psychological consideration whether its predicate is the sensible representative of what the subject means, and this depends on the sense-experience from which we learn the existence of the subject. Now as Kant admits that all analytic judgments may be *a priori* we have only to see that, to touch, his illustration of synthetic judgments is analytic and hence may be *a priori* instead of empirical. Every judgment thus may have its analytic and synthetic side and so be treated as either empirical or *a priori* or both, according to the sensory point of view from which the sub-

ject is derived. In taking this position I do not at present enter into any definition of empirical and *a priori*, but accept any meaning of the term which Kant may wish to have entertained. Whether they may not also be equivocal may be a subject of consideration later. But it will be apparent, if any judgment may be either or both analytical and synthetic, that confusion may easily arise in the application of empirical and *a priori* to them, and I may leave the reader to work out that difficulty for himself.

It would be an interesting question to ask Kant why he chose "extension" and "weight" as the qualities by which to fix the distinction. One cannot but think that he was influenced by the traditions of the Cartesian philosophy in which extension was made the essential property of matter and thus became at least evidentially convertible with it. Consequently it would be an analytical predicate of the subject. Weight was not so treated and hence was a contingent adjunct of matter. Kant seems never to have thought that he should have applied analysis both psychologically and philosophically to the Cartesian doctrine before accepting its conceptions as illustrating the foundations of his own system. He ought to have seen that, having raised the epistemological question, it was his duty to consider the source and validity of these conceptions before he used them for representing so fundamental a distinction to his own doctrine as that between analytic and synthetic judgments. They might be very good *ad hominem* agencies, but he should have provided that they also hold true in the system which he intended to substitute for the Cartesian and which he himself controverted. In other words, he should have seen to it that the conceptions held true also in his own doctrine. The assumptions of Descartes should not have been made the basis of a critical philosophy, especially as this latter was presumably dependent on epistemological inquiries. To show this, just take Kant's own illustration. As I have said, the judgment that "all body is extended," is from the Cartesian point of view undoubtedly analytical, assuming that we are dealing with either a visual or tactual percept for both subject and predicate. But does this hold true for Kant? If he will admit that space has objective reality in the

ordinary sense, we can answer in the affirmative. But Kant affirms that *Empfindung* involves *Receptivität* which he considers as implying objectivity as externality, but space (*Raum*) he treats as a subjective superaddition to the data of sense, if we accept the interpretation which most men give of him. This makes "body" a product of one process and space of another, so that extension, instead of being an analytic, is a synthetic addition to the conception of the subject, even when we suppose that subject and predicate are derivatives of the same general sensory process. This is to say that Kant based his philosophy on a distinction that might be apparent in a system which he did not hold and then set up a philosophy in which the distinction does not hold good for any purpose of his own. This means that Kant mistook the basis of his system and I think this contention is true. The basis of it was his doctrine of space and time and not the distinction between analytic and synthetic judgments. But in connecting his doctrine of space and time with this distinction, he complicated his philosophy with *a priori* and empirical considerations which simply produce confusion everywhere. I think a detailed examination of Kant's statements and illustrations will sustain this contention.

Let us take up mathematical judgments which Kant says are *ingesammt synthetisch*, and also *a priori*. From what I have already said regarding the distinction between analytic and synthetic, it will be apparent that I might insist on the relativity of its application to mathematical judgments. But I mean here to leave that question and discuss them as if the relativity mentioned did not exist. I have a more important contention to maintain and distinction to consider than this equivocation. This is that, while we may admit that mathematical judgments are *a priori*, they are either not synthetic in the sense in which Kant wants them to be understood, or their *a priori* characteristic has no value for the problem of knowledge as Kant conceives it, which is the validification of *new* knowledge or predicates.

Take his example of $7 + 5$ are 12. This is supposed to be both *a priori* and synthetic. Assuming this to be a fact, Kant thinks that he has gained a fulcrum against the scepticism of Hume and

laid the foundation of his own superstructure. It is noticeable, however, that he never produces the system which he says follows from it. On the contrary, he comes out with the agnostic results of Hume, and actually elaborates a mass of arguments to show that we are doomed to this scepticism! Kant had the ruinous habit of jotting down his impressions when they occurred and then never articulated them with his further discoveries. This is indicated by the *Nachgelassene Werke* and the *Nachlass* of Adikes. It is quite apparent even in the *Kritik*. The fact is Kant had no philosophic memory. Such a thing as a logically consistent whole seems never to have entered his head. If he could mouse around in the various philosophical problems and strike here and there a nugget of gold, he did not trouble himself with the problem of ascertaining a systematic knowledge of the conditions under which he made his find. I admit that he *thought* he was dealing with a systematic construction of philosophy, but he made no allowance for equivocation in the development of his doctrine. It was enough simply to repeat his conceptions and propositions without regard to the meaning which the context originally gave them. But this is a digression. In regard to the problem which we are discussing as well as others he seems generally to be either quite ignorant of the issue or fails to see the complexity of this issue.

Thus in regard to judgments of the type illustrated by the proposition $7 + 5$ are 12, he neglected to note that there are several different interpretations of what is possibly meant by them. They are not so simple in their meaning as was assumed, and this in regard to the question both whether they are empirical or *a priori* and the question whether they are analytic or synthetic. The question whether they are analytic or synthetic depends on the matter of the relation between subject and predicate. The question whether they are empirical or *a priori* depends on the matter of their origin, that is, the question whether their *universality* is an empirical or *a priori* product. If it were a question whether the connection between subject and predicate was empirical or *a priori*, there might be some simplicity in the problem. But it is not this, and I must distinguish between two wholly separate issues which

are confused by the right to apply synthetic and *a priori* to the same formal proposition. In the judgment which Kant uses, and it is a type of all, there are three different *real* judgments involved according to the modality stated or implied. (1) We may have $7+5$ are 12, in which we may mean no more than that it is a present fact, as "the iron is hot." Here there is only present factual connection asserted between subject and predicate, and nothing is either asserted or implied as to whether it is either *always* (factually) or *necessarily* a fact. That is to say, a question of universality, whether empirical or *a priori*, is not involved. (2) We may have $7+5$ are 12, in which we mean that the sum is *always* true in experience, as we know it, and it may extend no further than this experience as past. The universal is here simply empirical, as Kant recognises. (3) We may have $7+5$ are 12, in which the modality is tacitly assumed to be *necessity*, and we mean to say that the sum is *necessarily* 12 now and always. Here the judgment is supposed to be *a priori* and to hold for all possible experience. There are thus three different judgments concealed in the unqualified copula of the one form of statement. The modality of the connection between subject and predicate thus becomes a matter of implicit interpretation and not of explicit assertion. The copula is equivocal. For the sake of clearness I shall describe the three judgments as the *present*, the *mnemonic* and the *necessary*. I might say the present or singular, the universal, and the necessary, were it not that the universal and necessary are so often considered as convertible that confusion might arise. The expression, therefore, which I have adopted I think expresses the distinction which I wish observed in the determination of certain problems. Each judgment may have the same epistemological question asked regarding its origin. Hence (*a*) how do we come to know that $7+5$ are (now) 12? (*b*) how do we come to know that $7+5$ are (always) 12? (*c*) how do we come to know that $7+5$ are (necessarily) 12? Now the answer to these questions may not be the same in each instance. Kant agreed that the second judgment would be empirical, and did not discuss the first at all; in fact, was probably never aware that it existed and was in any way connected with the

epistemological problem. But assuming his admission in regard to the second and observing that the connection between subject and predicate in the first and second judgments is the same, namely, factual (Kant's empirical), that is, the result of experience, we may for our purposes simply draw the distinction between *factual* and *necessary* connection, and reduce our questions to *two*. First, how do we discover the connection between subject and predicate, and, secondly, how do we make it necessary? Or how do we discover it and how do we extend it?

Much might be said here about the nature and differences between the Lockian and Kantian problems, but this would not be necessary in the present case, since we might give that meaning to the controversy about experiential and "innate" or intuitive knowledge which would coincide with that between Kant's empirical and *a priori*, and thus identify the issues. In some respects at least they were identical, but apparently Kant never thought of the properly genetic question precipitated by the evolutionistic method and anticipated by Locke, in which the development of ideas is considered from the point of view of the infant consciousness. Kant's conception of the "genesis" was the same for the adult as for the infant consciousness. Psychologically he was correct whatever we may think of the chronological question in relation to the supposed complexity of certain ideas. But without entering into the analysis of the issues involved in the different questions of chronological and psychological genesis, the problem which we wish to discuss here is the simultaneous applicability of *a priori* and synthetic to the same judgment in the same sense. Kant's procedure is to show first that the judgment is synthetic and then that it is also *a priori*.

The test of this synthetic character is the non-implicit nature of the predicate. This appears unquestionable in Kant's statement of the case. But Kant has not considered the psychological questions involved in the matter. To both audition and vision the judgment in its inception at least is evidently synthetic. That is to say, aurally the perception of $7+5$ does not imply 12 in the same sense, and neither the child nor the adult would ever suppose

on the first occasion that the sum was 12. It is the same with the visual symbols. In neither sense is the identity between subject and predicate apparent, so that the judgment in that view of it is synthetic. But was Kant dealing with the sensory problem? He was not. He specifically regards it as a question of *judgment*. He ought thus to have seen that two aspects of the matter are noticeable. First, whatever is true in regard to the symbols in the case which give the appearance of synthetic character to the proposition, the fact is that the subject and predicate are *identical*, and whether this identity is seen or not in the symbolic representatives, the judgment answers to Kant's description of *analytic* propositions. He defined the distinction between the two kinds of judgment, not in terms of their origin, but in terms of the characteristics represented in the subject. Now the subject in this case is some number concept and the notion of identity between it and some other number is definitely indicated in the idea of their *sum*. The symbol for this is not implied, but a very definite predicate is implied, and the equality expressed in all mathematical judgments brings this identity out very clearly, so that, however the matter may stand for symbolic conception, the *content* of the subject makes it analytic in nature. We may divide as we please on the issue whether the connection is empirical or *a priori*. The decision of this will depend upon our definition of "empirical" and "*a priori*." If "empirical" means direct realisation in consciousness on the discovery of the identity between subject and predicate in the proposition $7 + 5$ are 12, there may be no distinction between this conception of "empirical" and "intuitive" or "*a priori*." If it means repetition in consciousness until an increment comes out at the end of the series not found at the beginning, the distinction will hold good. But I shall not enter into this issue while I am concerned only with the question whether the connection between subject and predicate is analytic or synthetic. I mean to contend that the nature of this connection, if definable in terms of the material relation between the two conceptions, is not dependent on either origin, and that there is as much reason for considering this relation to be analytic as synthetic. If Kant means to suppose that it

is the directness and immediacy with which the mind recognises the predicate on the presence of the subject that makes the proposition "all body is extended" *a priori* he will have to admit that the absence of these qualities in the judgment $7+5$ are 12 makes the proposition empirical, since he notes that the implication in this judgment is not immediate on the conception of the subject as in the case of the predicate extension of the previous illustration. Consequently it is not the manner of perceiving the connection, but the nature of it, however seen, that determines the character of the judgment. Hence, though the fact of identity of subject and predicate in mathematical judgments may not be seen at once on the statement of the subject, this, according to the standard of Kant himself, does not prevent it from being analytic, and hence, so far as we know, the *a priori* character attributed to it may arise from its analytic nature. Kant simply plays fast and loose here in the use of his criterion for empirical and *a priori* on the one hand, and analytic and synthetic on the other.

But let me suppose that I am wrong and that Kant is right in the opinion that $7+5$ are 12 is synthetic in respect of the connection between subject and predicate and the manner of its discovery, there still remains a way of considering the case which nullifies his doctrine in general. This is that it is not the connection that is *a priori* but the extension of the judgment, and this view will be found to have considerable consequences.

Now Kant never touches on the question whether the first discovery (by the child if you like) that $7+5$ are 12 is empirical or *a priori*. Possibly his conception of the terms did not require him to do so, but I do not mean to imply by my statement that he should have done so. I am merely calling attention to a situation which requires us to be clear in the application of those terms. As a fact there has often been confusion precisely at this point, and it has grown out of the habit of identifying immediacy with *a priori*, when the coincidence of the two concepts, in extension, may be only partial. Some have treated the first perception of such connections, where the identity is either not present or is concealed, as empirical, and some, if they did not like or use the term *a priori*,

have described it as intuitive, a term which, in a part of its intension at least, connects it with *a priori*, and which has even been made convertible with it. If we make the first discovery of this connection empirical we shall find ourselves where we must admit that mathematical judgments are empirical whether analytic or synthetic, and that would be to eviscerate Kant's doctrine at once. In his analytic judgment Kant made its *a priori* character depend on the process which proved it analytic, that is, its *a priori* nature followed from its analytic character. Now if the same criterion be applied to the judgment $7+5$ are 12, and the distinction between immediate and non-immediate be assumed to coincide with that between empirical and *a priori*, as is sometimes the assumption, and apparently the assumption of Kant, we should undoubtedly have to treat this judgment as empirical independently of any question of its analytic or synthetic character, but it would be no gain to follow the evidential method of the analytic judgments and make this one synthetic as a consequence of its empirical nature, because it is its *a priori* nature that is wanted for the system. On the other hand, if we make the first discovery of the connection *a priori* we should not be able to distinguish between the empirical and *a priori*, as they would both be equally immediate and we could not use the character of the process as an evidence of either the analytic or synthetic nature of the judgment, as Kant does in one case and cannot do in the other.

But the Kantian may reply that all this confusion is gratuitous and grows out of a misapprehension of what Kant intended in his application of the terms "empirical" and "*a priori*." He would say that Kant had in mind the application of them to the question of the *universality and necessity* of certain judgments. That is, Kant was discussing the question whether the generalisation involved in certain judgments was "empirical" or "*a priori*," and that this was wholly independent of the nature of the first discovery by the immature consciousness. Now I agree that Kant ought to have confined his discussion to the problem of generalisation, and that he intended to maintain that it was the universality and necessity of these judgments that was *a priori*. But unfortunately for the

clearness of his case he complicated the discussion of the problem by observations which at least implied that he was dealing with the initial perception of the connection between subject and predicate in mathematical judgments when he remarked that the conception $7+5$ did not immediately imply 12, a statement which is true only for the immature consciousness and not for the adult. As soon as the meaning of the two terms of the proposition is realised their identity is perceived and all the conditions of an analytic judgment are found present. Consequently to save himself this complication Kant had to state a case where this identity was not initially apparent, and forgot or did not know what the real principle was which determined the distinction between the two kinds of judgment. It was the principle of identity which enabled him to say in his analytic judgments that the predicate was implied by the subject and not the immediacy of the mental process involved in the judgment. In synthetic judgments this identity is excluded and consequently the implication is not likely to be immediate, so that on this criterion a synthetic judgment could never be *a priori* unless some other principle than identity be admitted in the theory of knowledge. In the *Nova Dilucidatio* Kant said that the principle of Sufficient Reason, whatever that may have meant at the time, had to supplement the principle of Identity in the epistemological problem, but he seems never to have applied his own doctrine in the *Kritik*. Certainly he does not here introduce this new principle to determine the existence of *a priori* synthetic judgments, but uses that of identity to determine analytic judgments and intuition to determine that of synthetic judgments, in which he allows *matter*, that is, the material relation between subject and predicate, to determine the existence of analytic judgments, and a *process* to determine that of synthetic judgments. Hence whatever his conception at other times regarding the problem of *a priori* judgments as concerning only universality and necessity, he here confuses it with initial perception and cannot be allowed to escape the perplexities which this involves without due apologies.

Accepting the view which was in reality the intention of Kant that *a priori* refers to the process which attests the universality and

necessity of a judgment and not the connection between subject and predicate, we can see that the issue then is as to whether this process is a valid one. We can dismiss the question as to what the process is that is involved in the initial perception where the connection is factual and may or may not be necessary and universal, and state the issue to be, not whether the initial perception is *a priori*, but whether the extension of the judgment, whatever the origin of the factual connection between subject and predicate, is *a priori* or not. This is simply to ask whether it is the *synthesis* or the *extension* that is *a priori*. Putting the question in this way saves the analysis of the judgment into two distinct judgments and enables us to escape the complications of a more elaborate discussion, though one may very well maintain that the latter method might be the clearest way of settling the issue. It is certainly one way and we may return to it.

In answering the question just put, whether it is the synthesis that is *a priori* or the extension, I mean to assume for the sake of argument that the judgment is synthetic in Kant's conception of the case, though I think it is in reality analytic as determined by actual content and the principle of identity. Kant's statement of the matter makes it apparent that he intended the *a priori* to qualify the synthesis as well as the extension, though it is possible that he did not mean anything of the kind. It is the juxtaposition of the two terms "*a priori synthetisch*" that creates this impression and perhaps produced an illusion in Kant's mind as to the real nature of his problem. At any rate, whatever he may have intended, we are here insisting on the distinction of the two questions, and I mean to contend that it is the generalisation or extension of the judgment that is *a priori* and not the synthesis of subject and predicate. If this view was the one intended by Kant, as it should have been according to the real terms of his problem, he ought to have seen that, for the mere purpose of getting *a priori* judgments, he was not concerned with either the origin or the nature of the connection between subject and predicate, though we shall see that the material conclusions would be altered.

Now Kant represents the "*a priori*" as an anticipation of expe-

rience, and of *all* experience in its pure form. But it was precisely because this immediate and anticipatory implication of the predicate in the subject was not made that he decided the synthetic nature of mathematical judgments. That is, the evidence of their synthetic nature rested on the ground that the synthesis was not *a priori*. Hence his conception must apply to the generalisation or extension of the judgment. That is, the extension is *a priori*, but the synthesis is not. Consequently the reason for the *a priori* character of mathematical judgments must be sought independently of their synthetic nature, while his philosophy obtained its cogency on the assumption that it was the synthesis that was *a priori*, and this in spite of the fact that the main conception of Kant himself in the *a priori* was that of universality and necessity. The emphasis which he placed upon the synthetic character of mathematical judgments taken with their simultaneously *a priori* nature had the effect of bestowing an *a priori* character upon the synthesis, which for aught that we know or need to consider in the case might have any origin, empirical or *a priori*.

I may confirm this conclusion by an interesting incident in the Kantian system. It is that Kant is shy of illustrating *a priori* synthetic judgments from the physical sciences. On one page he recognises that the judgment "*alle Veränderung hat ihre Ursache*" is not purely *a priori* because the conception "*Veränderung*" is empirical, though on the next page he seems to make the same judgment purely *a priori* by ranking it with mathematical judgments. Either he really assumes that mathematical judgments are not "*gänzlich*" *a priori*, or Kant here contradicts the position taken on the previous page. But the reason assigned for the imperfectly *a priori* character of the one judgment, as it is the same that is assigned for the similar impurity of another instance, that about the falling house, shows that Kant is willing to recognise that *a priori* can apply to the extension of judgments when it does not apply to their origin or to the connection between subject and predicate in the initial perception of it in the simply factual proposition. This once granted, it is apparent that it is not the synthesis in synthetic judgments that is *a priori*, but the generalisation. This

of course is still further fortified by the fact that *Veränderung*, which Kant says is a product of experience (*Erfahrung*), is an *immediate* presentation to consciousness. That is, experience may not require mnemonic processes but may be identified with the initial perception of any fact, and when *a priori* is denied of that it can apply only to the process of generalisation.

Having ascertained that *a priori* does not apply to the initial synthesis but to the extension of the judgment, the next question is whether this extension involves anything synthetic or not. If it does, Kant's case will be stronger: if not, it will be lost. What I intend to show, however, is that this extension is analytic in principle, so that whatever mathematical judgments may be in their initial perception, they are in their extension analytic.

Now Kant, as we know, makes space and time the principles of synthetic judgments *a priori*. Just how he determines this *a priori* synthetic character is not made clear, though it is usually supposed to be clear. His starting-point is the *a priori* nature of space and time; that is, he makes them *a priori* intuitions (*Anschauungen*). Now Kant does not make clear what he means here by the application of *a priori* to these intuitions. As he always treats them as subjective and not objective realities in the "common sense" conception of them, he can mean either that *a priori* is convertible with subjective and thus abandon its import of universality and necessity, or that it denominates a universal and necessary fact in the constitution of human nature. But in making space and time subjective intuitions, Kant has to fall back on dogmatism for affirming their universality and necessity in men, and simply begs the question at the outset. On the other hand, if "*a priori*" now means subjective in origin, Kant abandons that conception of the term which expresses the extension of the judgments concerned, and again obtains his point of *a priori* synthetic judgment by a subreption.

But I do not require to sustain this contention on either alternative. So far as my argument is concerned, space and time are *a priori* perceptions in any and every sense of the terms and are universal and necessary percepts. Whether Kant's evidence for

this was good or bad, I need not inquire. I may admit that they are all that they are claimed to be. But this admission does not carry with it the implication that the extension of mathematical judgments is synthetic. Certainly the *a priori* character of such judgments as expressing universality and necessity cannot be derived from the *a priori* nature of space and time perception conceived as subjective, and it may even be questioned whether their *a priori* extension is in any way dependent on an *a priori* genesis. However, I shall not insist on this doubt. But granting the Kantian claim in this respect, it is certain that the extension is itself not synthetic, as I proceed to show.

As we know, Kant maintains that space and time are the basis of *a priori* synthetic judgments, at least in mathematics. I accept the fact that they are the basis of their *extension*, but not of the *synthesis* of subject and predicate, either in the initial perception or their extension, at least in any sense involved in Kant's analysis of the problem. That it is not so in the initial perception is definitely proved in Kant's own conception of the case, and that it is not so in the extension will be shown by the nature of space and time. It may be worth noting, as a vantage ground for this contention, and in addition to the qualification that *a priori* applies to the extension and not to the initial synthesis, that many of our psychologists since Kant dispute the *a priori* perception of space and time. I agree that they do not understand Kant's problem and use of terms, and so may be correct in their view without affecting Kant's contention, but I refer to the circumstance for the purpose of remarking an equivocal use of the term which is always in danger of confusing discussion. But I do not care whether space and time are *a priori* or empirical perceptions; I can still admit the *a priori* nature of mathematical judgments in respect of their extension, but I would not condition the fact on any *genesis* of space and time perception, but upon the *nature* of space and time as realities, subjective or objective.

Now in analytic judgments it was not the immediacy of the implication of the predicate that made the judgment *a priori*, but the universality and necessity of the connection involved. This

universality and necessity then depended on the *identity of the subject* in all cases, and not the origin or nature of the connection between subject and predicate. It is the same in synthetic judgments. This is to say that the extension of a judgment depends on the principle of identity, or continuity. It follows that *all* synthetic judgments may be treated as at least *hypothetically a priori*; that is, on condition that the circumstances remain the same in which the synthesis of subject and predicate is discovered, and, the subject concepts always implying its identity, we may safely say that the connection between subject and predicate will always and necessarily hold true. But if they are only hypothetically *a priori* this will mean that they may not be *categorically a priori*; that is, the connection may not hold true in future fact, as the conditions may be changed. This is the case in the physical sciences. Change is the basis of their investigations and unless we make some one or more properties the *essential* characteristic of the subject concept either our universal judgments will always be hypothetically so or they will in no sense be *a priori* at all. This fact explains why Kant did not resort to the physical sciences for his pure *a priori* synthetic judgments, though he may have been unconscious of it. In the mathematical sciences he found the conditions of categorically *a priori* judgments; that is, judgments that were universal and necessary in material circumstances, always true in fact and not conditioned upon the *recurrence* of empirical events, but upon the constancy of certain facts in all conditions.

In making mathematical judgments, which were presumably synthetic, depend on space and time and also *a priori* in their nature, Kant does not seem to have seen the real reason for this conception of the case. It is in fact not the *a priori* nature of them, whether universal and necessary or not, but their *constitutional identity* as realities whether subjective or objective. By this I mean that they are *homogeneities*. In the physical world of matter we have no such homogeneities. All phenomena represent difference or change, and hence all universality there must be contingent and empirical. But in space and time we have realities that are homogeneous and identical, the same in kind throughout, constant and

continuous in nature. Any part in each is like the whole, so that difference and change do not occur. They are thus realities which represent in its absolute sense the *principle of identity*, while this applies in such a partial sense in the world of physical phenomena as to nullify categorically *a priori* generalisation. Hence all judgments based upon space and time for their *a priori* character simply rely upon the homogeneity of their basis, that is the principle of identity, for their universality and necessity. This is to say that the *extension* of these judgments is not synthetic, but analytic, whatever the relation between subject and predicate. It must be this if it represents an application of the principle of identity, because in both the connection between subject and predicate and the extension of the judgment in analytic judgments Kant had to depend on the principle of identity for the *a priori* nature of the result. As space and time are of the nature of continuities and homogeneities they can condition the *a priori* extension of mathematical judgments only as representatives of the principle of identity which is confessedly excluded by Kant from the synthesis of subject and predicate in synthetic judgments. Hence we must make mathematical judgments *a priori*, not because they are synthetic, nor merely because they are conditioned by space and time as facts, whether *a priori* or empirical, but because the nature of these realities supplies the data for an *a priori* extension, and this is their embodiment of the principle of identity.

Mathematical judgments are based upon number, at least those which Kant has chosen for illustration. In geometry both space and number are involved. Number is determined by time and space as principles of individuation. The unities expressed in number thus depend on the homogeneity of their basis. Kant says nothing of this fact, nor of the nature of space and time as realities, and hence does not even see in what sense they condition the extension of mathematical judgments. All that he said was that mathematical judgments were universal and necessary and that they were conditioned for this quality by space and time; and presuming that they were synthetic in either their initial perception or the relation between subject and predicate, he neglected to observe

that the question was not as to the *a priori* nature of the synthesis but as to the extension of the connection involved. But finding a coincidence between the *a priori* nature of mathematical judgment and their dependence on space and time for their meaning, he jumped to the conclusion both that the synthesis was *a priori* which he did not admit in the initial perception and that the extension was *a priori* on the same ground, when as a fact this extension was dependent on the identity of the subject of extension. This is simply to say that the *a priori* extension was not based upon the *fact* that space and time conditioned it, but upon their *nature* as representing the law of identity. *That is, it is the principle of identity that determines a priori judgments.* This is apparent in the physical sciences from which Kant is apparently careful not to select his illustrations. Here it is not space and time that condition either the synthesis or its extension in many judgments, and hence when he supposes universal propositions, whether empirical or *a priori*, just as in his analytic judgment, he must rely upon this principle of identity for determining the extension. That is to say the universal principle of *a priori* judgments is the law of identity in some form, and not space and time. In mathematical judgments it is merely a coincidence that they should be *a priori* and determined by space and time. If this basis of space and time did not represent also in their nature the principle of identity, then such judgments would have the same character as those in the physical sciences. Hence we can as well say that it is not space and time, as such, but only as identities, homogeneities, continuities, constants, etc., that determined the *a priori* character of mathematical judgments. In brief, as said, it is the principle of identity that determines the *a priori* extension of any judgment, and this is to make this process analytical, not synthetic. In this conception mathematical judgments become analytical in nature, whatever language we may choose to apply to the initial perception of the synthesis of subject and predicate.

But whether this is true or not, it is an interesting circumstance that Kant never applies his doctrine to establish a system of metaphysics which ought to follow from it, if his refutation of

Hume is to be taken seriously. His refutation of the ontological argument for the existence of God depends wholly upon the assumption that its basis is analytic. He ought to have seen that, after presumably establishing a principle of *a priori* synthetic judgments, that argument was open to reconstruction and that an ontological argument for the existence of God, whether based upon the mere idea of him or other facts, was formally possible, and that his refutation of it in all forms was dependent wholly upon the assumption of Hume's philosophy which he started out to disprove. That he might have applied some synthetic principle to construct an ontological argument is apparent in his *Widerlegung des Idealismus*. Here he asserts that the "consciousness of my own existence proves the existence of objects in space eternal to me." A state of consciousness is thus made to imply a reality "outside" of it. That is, we have an ontological principle here which is synthetic and might be easily applied to the "idea of God," if we so wished. At any rate, Kant actually assumes that consciousness can transcend itself in its knowledge, and whether right or wrong, he ought to have seen that both in this assumption and his doctrine of *a priori* synthetic judgments there were data for a formal defence of the ontological argument against the sceptical outcome of Hume. But he in fact founds Hume's conclusions on the refutation of Hume's premises! I am not saying that his attack on the ontological argument as conceived was not valid, but that it was incumbent upon him to reconstruct its conception on the basis of the principle of sufficient reason which he recognises in the *Nova Dilucidatio*, as said above, but to which he never alludes in the *Kritik*. On the principle of identity the ontological argument undoubtedly fails, but on the principle of sufficient reason and of synthetic judgments *a priori* it might take a new form. I am not here contending that we should recognise the principle of sufficient reason in the problem of knowledge, but that Kant ought in consistency to have recognised it after saying that the principle of identity needed supplementing in this way. Hence it is the general contradiction between his profession at the outset of his system and the results

at the conclusion which I wish to note. Hume's conclusions ought not to have been based on the refutation of his doctrine.

Of course it will be apparent that my denial of the synthetic character of mathematical judgments and the *a priori* nature of physical judgments results in justifying Kant's arguments on the metaphysical problems, as I show that he in reality uses nothing but the principle of identity in his fundamental theory of *a priori* judgments. By making him wrong in his theory at this point, I may accept the legitimacy of his conclusions, but I must contend that the contradiction indicated rather suggests at least that Kant did not understand his own problem, and that epistemological matters need a reconsideration quite independent of his way of dealing with them, even if they have to begin with a discussion of his doctrine.

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THE SENSE OF DANGER AND THE FEAR OF DEATH.[1]

A SENSE of danger, or some primitive equivalent for it, is, and always has been, a necessity of conscious life. We can trace its beginnings in the most lowly creatures; we can follow its evolution through all the phases of animal consciousness; we can imagine how important, how vital a function it fulfilled in the gregarious life of savage men; and now, under a veneer of latter-day culture and often obscured by a halo of modern piety, we still discover it as one of the most constant and characteristic elements in human consciousness. In all studies of the natural history of consciousness we read of the instinct for life, the strenuous avoidance of injury and death, as fundamental,—the first, the basal instinct upon which the reproductive and all other modes of consciousness and activities are built. And, if we analyse this instinct for life, it is clear that some method of warning, a sensitiveness to danger, is as essential as a method of escape. The fear of death is one of the emotional forms in which we express this instinct. No matter how it may be modified by convictions relative to the life beyond—the dread of torment, the hope of bliss—and although an educated self-control brushes the instinct aside so that most men do not care, and would as soon face death as life, yet the fear of death is in the blood and in the bones of men and for a moment at least will out,—a startled shrinking from the cold, solitary, disintegrating grave; a sudden terror when, for the first time, the pain of some fatal disease intimates that the end has begun; a suppliant

[1] A "St. Andrews" Lecture delivered in Edinburgh.

private cry for a little longer, a reluctance to part with life, a desperate and perhaps defiant refusal to give in when Death is stealthily drawing closer his pickets.

That instinct not to die, the frightening aspect of death, is bound up with a general sense, a sense of danger. I therefore do not propose, as some apparently have imagined, to discuss how to feel and think in contemplation of one's latter-end. I couple the general and particular aspect in one title and propose to discuss fearfulness as a mode of consciousness,—to illustrate some of its phases so as, if possible, to suggest how to bring all disturbances of equanimity within one general conception; and, in particular, to indicate its evolution, its teleology (that is, the social uses of fear), and lastly its treatment,—some hint of the mental therapeutic likely to combat such disturbances. From all of which you may gather that I conceive of alarm as having physical origin and a physical explanation, that I regard anxious-mindedness as of the same nature, physiologically, as brute terror and that I set myself the task of indicating how fearfulness, as a constitutional tendency, sometimes abated, sometimes perverted, sometimes exaggerated, must play a very important part in spiritual life and ought to be understood and controlled. Such a programme covers a large ground, and I can only hope to remark upon the various aspects of the subject lightly and cursorily, yet, I trust, with sufficient amplitude to make clear my whole meaning.

If you touch a worm which has wriggled half way out of its bed,—after brine has been poured upon turf, for instance,—it will immediately and rapidly retreat so that it is almost impossible to pick it up; a snail, drowsing lazily in the warm shade, draws in his horns with quick alarm at the slightest touch; untamed reptiles recoil like a mainspring from human contact; a similar experience occasions something like a fit in fishes, even in the domesticated variety in glass-bowls; cattle, sheep, and horses, until they are accustomed to handling, shrink and shiver, and, if convenient, run away when you would stroke them; birds, scariest perhaps of all the land species, are horrified at the slightest approach to caressing. Taking these facts at their simplest, we have to note here

what we call an immediate reaction, the spring of muscles directly let loose by the stimulus applied,—almost as simple a process as the loosing of a shaft from the bow. We may not call the worm anxious-minded; it is simply prepared on the slightest occasion to wriggle. And, mark you, that simple and direct response—protective in its nature—occurs in man also. Most people if suddenly, though however slightly, touched when not prepared, recoil,—an immediate reflex activity. From so primitive a reaction we might trace step by step the evolution of the elaborate processes which underlie fear. I have selected the reaction to touch as the simplest. To understand the more complex nervous states, you must in the first place multiply the possibilities of stimulation and then, as explaining the intensity of fear, limit the possibilities of reaction.

Consider the first for a moment, and note that in all the highly organised forms of life alarm may be occasioned by messages received through any one of several avenues of sense. Untamed herbivora and birds offer the best illustration,—a herd of deer, for example, or a flock of crows. To them, new forms of contact of a gross kind are a rare experience; but I would suggest that these creatures have a skin-sensitiveness that we cannot appreciate,—that the feel of the atmosphere stimulates them in appropriate fashion. Over and above that, however, note the exquisitely sensitive organs of sight, smell, and hearing; crows perhaps specialising in sight, deer in the sense of smell. The nervous condition is such that we may certainly describe deer or crows as constantly on the *qui vive*, and the physiological account of their alarm is simply that the sensory tracts from the external organs inwards to the central ganglia are acutely active. In human life we have to some extent evolved away from that purely sensory hyper-activity. As men, in camp and village, learned the art of specialisation, and evolved the idea of sentinels and scouts—a function not unknown in the lower animals—those in the inside had no need for this acuteness of sense-perception, and their capacity for fear grew into relation with another group of functions,—the functions associated with ideas. They learned meanings; they read the signs of the

times, more indirectly, more critically; they learned the news of the camp or village, and often enough with alarm. Far off on the hillside a man runs fast towards the camp,—panting, gesticulating, shouting, incoherently; old and young turn out to hear his tidings, some are sent to meet him and hurry back with what he has to tell. The enemy are on the borders, it seems. Well, but who are they? How many are there? What is their plan? And how many are there of us? How are we prepared? Fear thus comes into relation with facts and ideas instead of being simply occasioned by alarming impressions or sensory stimuli. And so we have the development of the fearful imagination,—a sense of danger aroused by pure fancy. Night terrors, for example, are usually of this nature. You will recall the description in Job: "In thoughts from the visions of the night, when deep sleep falleth on men, fear came upon me and trembling which made all my bones to shake. Then a spirit passed before my face; the hair of my flesh stood up; It stood still, but I could not discern the appearance thereof; a form was before mine eyes; there was silence, and I heard a voice saying, Shall mortal man be more just than God, shall a man be more pure than his maker?" The process is the same only wider in such emotional states as in the shrinking worm and in the frightened deer—an intense activity in the inner mechanisms of sense, reflected outwards to the muscles in trembling and restlessness and a readiness, were it convenient, to bolt.

And that brings me to the second factor in the physiology of fear—the limitation of the outward reaction. Frighten a crow and it croaks and flies, alarm a deer and it snorts and gallops; but the human mind, a consciousness doomed to offices and back parlors, unprovided with wings, linked to stiff limbs and scant breath, has no such outlet. The startling activity that courses along the sensory nerves of a man or a woman who is afraid simply circulates until it is spent, unless the mind hits upon some device, however inane, that seems to promise safety. This is apart from the fact that fear, in its simple forms, has a definite gymnastic—rigidity, then trembling, then relaxation of many of the muscles, dilated pupils, pallor, erect hair, dryness of the mouth, and other symp-

toms. These are simply reflex effects; you will find an easy account of them in Darwin's *Expression of the Emotions*. The fact that they are so constant is corroborative of my present point that fear has an organised, constitutional basis. But these effects are quite inadequate from the spiritual point of view; they do not constitute a line of conduct appropriate to the occasion. When disaster threatens, it is worse than irrelevant that your hair stands on end and that you cannot swallow. I repeat that an essential factor in fear is the limitation of proper conduct. As I have elsewhere and repeatedly remarked, pain—and fear is a form of pain—is the result of a nervous state in which there is not an outward activity equivalent to the internal activity of the moment. That, however, is by the way. What I wish to enjoin is that we are all so constituted as to have a definite and organised mechanism of alarm—a system of nerves and blood—which implies a capacity for fear that besets us from the cradle to the grave. The mode of consciousness is the same, and the physiology of it is the same, in the child who awakes in screaming terror by night, in the youth who breaks into a cold sweat at the bidding of his conscience, in the man whose knees collapse at the thought of his liabilities. In all such states there is an over-activity of impressions and a limitation of voluntary modes of expression. Impressibility, in certain circumstances, painfully in excess of appropriate response, is part of our organic heritage.

In this connection it is convenient to point out in passing that this capacity for fear is, as we might expect, more likely to become active under certain physical conditions. I shall not dwell on this point, for you must all be aware of an increased tendency to suspicion and apprehension in certain abnormal states. External factors may favor it; see how darkness aggravates fear; so do certain climatic conditions, in particular that atmospheric condition popularly described when we say that the air is surcharged with electricity; the rare atmosphere of high altitudes may increase fear—probably by its effect on the heart. Disturbances of the heart's action from whatever cause very commonly induce anxious-mindedness; so also do disturbed sleep, faulty digestion, anæmia, and

allied disorders of the blood. Any condition in short which interferes with the proper nutrition of the nervous system induces, as you are aware, that excess of sensibility popularly recognised as "nerves." Certain bad habits of mind also predispose to fear; perversions of the imagination for instance, that habit of unbridled day-dreaming which afflicts idle minds, and, in particular, indulgences which goad the conscience. And the condition is determined also, at critical periods of life incidental to development and involution—in early childhood, especially up to about the seventh year when the sensory organs are rapidly maturing; during adolescence; at that strange period—critical in the lives of many men as well as of women—towards the end of mature life, which ushers in the calmness of advanced years; and particularly in the critical months of maternity. These are times when people must expect to be beset by useless fears. It would be an interesting and quaint study to collect and analyse the various grounds that are found for fearfulness at such times; for the mind, vaguely apprehensive, disturbed by nervous processes which it does not recognise as of subjective origin, reaches out to find a cause for fear in irrelevant facts—the prevalence of cancer, the national debt, the unpardonable sin, insolvency, the yellow danger, or even the lack of an effective parliamentary opposition.

But let us now revert to the natural history of this mode of consciousness as a prelude to some remarks on its teleology—the uses of fear in the spiritual economy. And, let us beware lest, in reviewing facts of animal life, we interpret them too freely and ascribe to the creatures whose conduct we study a state of mind that probably does not exist; for we are particularly liable to that fallacy when we discuss the origin of emotions of which fear is one. A great many creatures of all species appear to be very timid, and especially those, as we might expect, that have not strong weapons of offence. That brings me at once to a contrast which I wish to emphasise—the contrast between offensive and defensive creatures. That is a contrast which is quite arbitrary, and I beg of you not to think of it as a classification. It is not a classification because the qualities in question are not distinctive. All animals are defensive.

I only wish you to observe the fact, quite rough and approximate, that some creatures are on their defence most of the time, and that others are distinctively aggressive. For example, it is obvious that the common housefly is a timid and fugitive creature compared with the audacious and predatory midge. As far away as insects, then, we can perhaps distinguish between a mode of consciousness which signifies a habitual readiness to attack and another which signifies a habitual readiness to escape. If insects have a self-consciousness—if they are capable of regarding themselves as in relation to an environment—which, for my part, I very gravely doubt—then some of them are trying, much of the time, to catch something and others are trying not to be caught.

We might—if time permitted—follow up this line throughout many classes and species of the animal kingdom. Among reptiles, for instance, contrast the armed and predatory crocadiles and alligators, the python, the boa-constrictor, the cobra, with the comparatively defenceless and fugitive turtle and tortoise, and the harmless lizards and snakes; the amphibia—frogs, toads, newts, and salamanders,—are nearly all timid, waking to seek for food for the most part at night; among fishes, contrast sharks and sword-fish, perch and stickle-backs, with the inoffensive cod and salmon, haddock and trout; and, among birds, the aggressive eagle, hawk, owl, and bat, with the defenceless doves, crows, seagulls, and sparrows. In these instances surely a difference in habit implies a difference in consciousness—a predatory instinct linked to weapons of offence, a fugitive instinct predominating in varieties not similarly armed. It is among mammals, however, that the contrast is most striking and most cognate to our theme. Roughly speaking, the carnivora—the flesh-eating mammals,—furnish us with the best examples of the aggressive types, and the herbivora—the vegetarian forms—illustrate the fugitive mode of consciousness. As I have said—and caution calls for repetition—the whole subject is a matter for conjecture; yet it were strange if, with such diversity of structure and of habit, there was not a corresponding difference in consciousness—between the warlike panther and the watchful an-

telope, the tiger and the heifer, the wolf and the sheep, the weasel and the rabbit.

Through all nature then, the fitness by which the species survive is, in some cases, a power of offence associated with a character that includes courage, audacity, ferocity, readiness to attack, and in others, and, I think, the vast majority, a physical defencelessness, associated with caution, timidity, constant watchfulness, and a readiness to escape. To us, to the human consciousness, these diversities have descended. There are men and women amongst us not unfitly described by the slang that designates them as sharks, people who are always on the pounce, some of them aggressive in manner, many of them bland and sly, yet none the less predatory, bent upon turning everything and everybody to advantage, whose outlook on the world is as a place wherein to acquire property, place, and power, and who regard every neighbor as fair game. And there are others in hosts who are mostly afraid—unassuming persons both in manner and character, whose chief desire they share with the rabbit—just to be left alone, and who suggest, in their suspicion and anxiety, the apparent state of mind of the coy and prudish cow. These are not mere resemblances, not unmeaning analogies: they are identical qualities determined by the same kind of blood and nerves, evidence of functions, structures and instincts which have been evolved in the hard struggle for existence and have been transmitted to us from the loins of the brute creation as surely as our eyes, our lungs, our hearts.

If you have doubt of this organic heritage, let your mind wander back in what vividness of retrospect your fancy can muster, to the primeval life of man, when in forest and in jungle, on bare and open hillsides, and on unprotected shores, he battled for his life and for the wife and children whom he loved with the fierce passion of a beast. How thrilling is the idea if you succeed in thinking yourself back into such a life! Or, is it rather unpleasant? So far as fear of bodily hurt is concerned, you can arrange yourselves now into the predatory and the fugitive. I wonder how many men in the room would rejoice in that forest life—to hunt and be hunted,

to scan every blade of grass, the twigs and soil so as to learn where the prey lurks that you want for dinner, yet all the while alert and alive to every sign that warns you of attack. And, ladies, how many of you would rejoice in such a life—clad in undressed deer-skins, hidden away in some sequestered cave, or perched perhaps for hours in the safe fork of a forest tree, grinding the flint of your husband's battle-axe or trimming his primitive arrows? Would you like occasionally to sally forth with him on his hunting expeditions, to carry his weapons and help home with the spoil, and sometimes, if you were good, to be allowed yourself to spring a shaft at the wild turkey, or even, it may be, to test the axe-head you had wrought, against the grizzly bear? But let us think of that period impersonally, and whatever our views of the origin of human existence may be, we are compelled to admit that, in primeval life, men must have survived very largely because of the acuteness of their sense of danger. A stage further, and you have the tribal life—the life of the camp or village to which I have referred—and there again, though the idea of sentinels has been achieved and those inside live in comparative safety, we are bound to assume that the capacity for fear—caution, suspicion, anxiety—was a very strong feature in the primitive mind and one which has transmitted as a physical endowment, from generation to generation, from race to race, and survives by force of heredity in the consciousness of to-day.

For the qualities which man inherits and by which he has survived, do not rapidly atrophy and disappear. The cerebral structures which were providentially evolved in primitive man in order to his survival, the vital structures, the structures necessary to protect and prolong life, are deeply organised in the seed of the human race, and are, to all intents and purposes, everlasting. We shall see presently that some of them, including fear, are dwindling, but they dwindle very slowly. I have not time, though it would be instructive, to recall to you the vestiges, in the human anatomy, of the structures in vogue in prehuman times. Let me just remind you that, in the development of the human embryo, there still appear gill-slits which are the vestiges of the gills of fishes, that

the human heart is at first tubular as it is in some lower animals, that the tail persists though it has been sat upon since man was man, that, in infants, and in some adults, the moulding of the brain resembles that of more primitive mammalia more than the recognised human type. These are the subject of common knowledge; you are all familiar with the idea of vestiges—that you bear about in your bodies the stigmata of a prehuman ancestry.

But perhaps you are not so familiar with the fact that there are as many, perhaps more and more significant, vestiges of the prehistoric consciousness in your consciousness of to-day. Here we arrive upon that vast field of speculative psychology—the functions of subconsciousness. For these vestiges of which I speak make a contribution to personality which is vague and occasional, not clearly apprehended, not lending itself to analysis, not recognised by us as part of our normal or typical mental equipment. You have heard, I suppose, that some people, R. L. Stevenson for example, recognised that the brain is like a bee-hive in which a vast deal of activity that we wot not of is constantly going on and brings about results that we do not understand. The "little people," I think Stevenson spoke of, who worked his plots out for him in the night, or sent the words which he could not by however great efforts lay hands on. You know Clark-Maxwell's conception of demon-atoms in material things,—invisible entities that explained chemical affinity, the cohesion of matter, the galvanic arrangement and rearrangement in metals, and such like phenomena. Our brains are beset by demon-atoms, sometimes helpful, sometimes unkind. Sometimes the works are sticky, sometimes smooth, sometimes the demon-atoms go on strike, sometimes, just when we are achieving a triumph of peaceful work, they run amuck and create no end of disturbance, and nearly always, when we are asleep, they run about and play high jinks so that in the morning we discover the mischief the goblins have wrought with our memories, or, more often, the kindly offices of these brownies. These subconscious activities pertain to inherited qualities. No phase through which consciousness has evolved is wholly obliterated; each leaves an organic legacy to the race. Down through all the

ages the brain of man has been building itself up in relation to one and another kind of life, and, as his mind compassed one and another kind of idea, realised one and another form of emotion, gave itself over to one and another kind of sensation, projected itself in one and another line of conduct, the organ of consciousness wove into its fabric strands and fibres of each so that the brain and subconsciousness of to-day are an epitome of man's history and of prehuman experience, and our personality is beset within and without by instincts which embody the traditions of all the generations.

If a figure of speech will help us to grasp the reality of the subconscious in personality, let me suggest to your imagination a royal robe of which I have heard. An Oriental robe it was whose beginning was in a prehistoric dynasty of which the hieroglyphics are undecipherable. With that pertinacity and durability so characteristic of the East, this royal garment has been handed down, not through hundreds of years, but through hundreds of generations,—generations, some of them, unconscionably long, and stale, and dreary, others short, and quick, and merry. A garment of Kings, this, and of Queens, a garment to which, as tradition prescribed, each monarch added something of quality,—a jewel of price, a patch of gold, a hem of rich embroidery,—and with each contribution a legend, worked into the imperishable fabric, told the story of the giver. Did something of the personality of these kings and queens linger in the work of their hands? If so, the robe was no dead thing, no mere covering to be lightly assumed or lightly laid aside, but a living power, a royal influence, and the wearer, all unwitting, must have taken on something of the character of the dead. It is a Princess of the royal blood perhaps, sensitive and mystical, trembling on the apprehensive verge of monarchy, who dons the robe, and as she dons it, tingles to its message. These great rubies that blaze upon its front are the souvenirs of bloody conquerors. As she fingers them idly, she is thrilled by an emotion she does not understand, for in her blood something answers to the fighting spirit they embody. Pearls are for peace. That rope has been strung by kings and queens who favored art and learning; and, as the girl's fingers stray towards them, the in-

spiration changes and her mind reverts to the purposes of the civilised scholar. Here is a gaudy hem, the legacy of an unfaithful queen, steeped in intrigue all her life until her murder ended it; and, as the maiden lifts it to examine it more closely, she learns with shame and blushes, yet not knowing what has wrought this change in her, that, deep down in her character, are mischievous possibilities, possibilities of wickedness and disgrace that will dog the footsteps of her reign. Suchlike are the suggestions which the hidden parts of the mind bring forth, and in such subtle manner are they born. Without explanation, without sufficient ground, fear may be insinuated into our consciousness, derived from instincts that our fathers knew and needed.

Yet fear, like other infirmities, has its uses,—a usefulness not only to the single life, but one also that is important to life and character in general. That is teleology. Teleology, as I understand it, gives an account of functions which looks beyond their immediate and primary uses and interprets them in the light of a general conception of the evolution in which the whole creation lives and moves. Science does an injustice to itself and makes a doubtful contribution to philosophy when it stretches a point in favor of a view of life other than its own or makes any sort of compromise with unscientific conceptions; and in attempting to give an account of purpose in nature we are particularly prone to error. But, strictly within the powers and province of science, we must recognise a general and ulterior end in life; indeed, no conception of the facts of nature is sound which does not have regard to their remote and general effects, their relation to a universal process. All through nature we must observe what in a literal sense of the adjective I would call a providential, that is, a prospective purpose in things; a purpose other than the personal and immediate one; a purpose in the lives of creatures, for instance, which reaches far beyond the personal experience of the creature and takes its place in a general process. The accounts which the physiologist and the anatomist and the naturalist give of an animal are quite incomplete and insufficient as a contribution to biology; you must go deeper and farther than the mere description of the nature and

habits of an animal and appreciate its place in the constant, the eternal purpose to which all life contributes.

The same is true of mechanisms and of functions. The uses of fear, for instance, are quite incompletely described when you show how it has saved the lives of so many worms, so many fishes, so many birds, so many mammals. The functions of fear are far beyond that; they are part of a process which is eternal, that is, stretching to an unlimited extent farther back than the mind can reach to, and farther forward; they represent a quality which persists through all creation, a character which is being perfected from one generation to another, a factor in a developing personality which is quite remote from the immediate and obvious uses of fear. We might observe, for instance, the correlative effects of the sense of danger induced in organisms other than that which is subject to fear,—the response which fear evokes in its environment. A special development of any sort begets a corresponding adaptation in all the world with which it comes into close contact. An improved sense of danger, an increased wariness, reacts at once upon the intelligence and skill to which it is opposed. The more wriggly the early worm becomes, the more skilful becomes the blackbird; increase the scariness of the frogs and fishes in the shallow pools, and forthwith comes an improvement in the skill and craftiness of the heron; improve your breed of foxhounds and the foxes that escape will be more cunning than ever and you must improve your hounds again or have surreptitious resort to the ignominious bag. These are correlated adaptations brought about in various species by the keenness of their contest and by the closeness of their relation to each other. Human life affords abundant examples of the same thing. The more daring the "enterprising burglar" becomes the more intelligent and active become the police; all law-breakers, provided their sense of danger stimulates them to more skilful efforts, make a valuable contribution to intellectual life by eliciting a correlated acuteness in magistrates and public prosecutors; make new laws—factory acts or joint stock company acts, for instance—and you promptly stimulate the sense of danger of manufacturers and company promoters, their skill in

evading the law improves, and you must draw still closer the meshes of your legal net—a remote effect of fear which must have a quite salutary consequence in the intelligence of the House of Commons.

I would remind you also that certain animals started a very good idea which primitive man adopted and which is still followed out—the idea of specialists in the sense of danger. In uncivilised times, in the life of the camp or village, men were selected whose functions of alarm were extra good—scouts and sentinels whose skill in watching allowed those within the camp to develop, with an easy mind, their domestic and social affairs. We have not entirely departed from that idea, and we might perhaps with advantage develop it farther. The clergy, for example, are specialists in the sense of danger—a kind of moral scout; for it is part of the duties of the pastor to detect in your character or in the signs of the times what is dangerous and demands a warning. Others we have, self-appointed but not to be neglected, some of them wise and some of them, whom we call alarmists, foolish. Your alarmist is a specialist in fearfulness. It might be good if we were to more explicitly recognise the functions of these gentlemen and ourselves play the part of those within the camp, pursue the even tenor of our way with an easy mind, and respond just at times to the warning voice of the watch-dogs.

There are few more interesting subjects of study for the evolutionist than to observe how structures and functions which were developed in relation to a given environment, persist long after the need which occasioned them has ceased, provided they find something in their altered circumstance to which they can become actively adapted. The process to which I refer is well illustrated in human evolution. Most of the amenities of the human consciousness are by-products of what were once vital functions. An eye for color, for instance, is but a polite variation of the common and necessary sense of vision; a palate for fine wines, an ear for music, are developments which in peaceful leisure the human mind has carefully elaborated by adaptations of vital organs. In prehuman life and in the life of uncivilised man, the protective function of

the sense of danger is very obvious. And fearfulness still has some uses of that sort, especially in warning against the beginnings of diseases. But, generally speaking, the capacity for fear in the human mind is absurdly in excess of its utility. As men evolved past that stage when danger to life was constant, fear as we have seen attached to ideas and sentiments; and then its mischievousness began, for there is no end to the possibilities of fear when linked to a vivid imagination. It is at that stage when life became comparatively safe that the by-products of fear began, and many of them are very fantastic. As death became less likely the fear of it did not rapidly dwindle, but only very slowly, and it is still dwindling only slowly. Although not much wanted, the fearful emotions have survived in relation to the higher experience. For as soon as early man made himself safe he set out to discover new things to be afraid of, new uses for the obsolete emotion; all peoples have perpetuated the practice and we to-day are still engaged in imagining and inventing things which will satisfy our appetite for suspicion and alarm.

In the religious consciousness fear has always been, and for a long time will be, an important factor. From the crude terror of the danger of the gods to the fear lest the life should put the soul at enmity with its Saviour all manner of fear-stirring ideas have occurred to devout men and women, sometimes it must be confessed with little more than an emotional result, sometimes prompting to carefulness and a new and better way. Indeed, fear was the incentive at least in the Sunday schools of the passing generation to which teachers most appealed. Our adversary, the devil as a roaring lion, goeth about seeking whom he may devour—the predatory habit again; and the fugitive soul, if not panic-stricken, assumes a greater watchfulness and achieves a greater skill in defeating the wiles of the evil one.

We might extend this line of inquiry indefinitely and try to appreciate, in domestic, social, and political affairs, the good and the evil of suspicion and apprehensiveness and the correlated qualities which have developed in relation to them. We can sum up the matter by saying that fear has been a very conspicuous factor

in the development of personality even when it was apparently unnecessary and irrelevant. Emotions are in the first instance nervous disturbances, and latterly a kind of goad or spur to the human consciousness. The emotion which we call fear has been very potent in stimulating the intelligence of those who were afraid and of those who were to be feared alike. But just as every stage of evolution calls for a new kind of intelligence and an improved standard of skill, so also does it demand new emotions, or at least new emotional forms. Fear is no longer suitable, it is not the form of emotion most adapted to the conditions of modern life; our consciousness demands some other source of inspiration. When all is said that can be said about the uses of fear we come to the conclusion that on the whole the sense of danger is a nuisance. Fear is out of date, an anachronism, a vestige, a superannuated and silly servant that has seen better days, has done excellent service and should now be superseded. Fear, under any circumstances, is a disadvantage and out of place. We cannot begin to know the meaning of freedom in spiritual life until we have done with it. Until men and women learn that there is nothing about which it is worth while to be anxious, until they put fear aside and look forth upon the world with equanimity and confidence, they cannot exercise a free judgment nor exert a free will.

We may, I think, conveniently review now what I have been trying to say and restate the argument in summary form.

The fear of death and other fears are part of a general sense of danger, an organised function of alarm; that function is instinctive, it is part of our organic heritage, and it is constantly represented in the nervous system by an appropriate mechanism; on occasions, often irrelevant, that mechanism becomes active, gives rise to an excess of impressions, and occasions in the mind a state of anxiety. This group of functions has its beginnings in primitive creatures in simple and immediate reactions to sense-impressions; it can be traced through the animal kingdom in more complex forms corresponding to the manifold relations and varying experience of the higher animals. The uses of fearfulness to the beasts and in uncivilised human life are obviously protective and very important.

It still persists, however, in human consciousness in these comparatively peaceful times when it is for the most part irrelevant and inconvenient, and in many people it is so strongly developed that they can be described as of an almost constantly fugitive state of mind.

I have nothing that is new or important to say on the therapeutic aspect of our subject, what a man ought to do who is unduly beset by fears. We must bear in mind that, in disordered states of health and when an unusual strain is being put upon the nervous system, the mind is almost certain to suffer emotionally, and fearfulness *will* come. It is no use advising a man to keep in good health or to avoid stresses; ill health and strain have got to be faced. But a man who knows his own mind and who commands it will expect to be anxious on occasions and he will learn to ignore his fears. He will recognise that none of the things he is afraid of really matter, that to sit under an expectation of misfortune makes life unbearable, and he will tell himself not to be a fool. I would remind you of what I said of fear as of all painful states, that it is determined by an excess of vivid impressions for which there is not an adequate activity on the expressive side of the mind. Distress occurs when there is impressional activity without a corresponding development of constructive ideas or of appropriate conduct. The more I consider that account of painful states, the more important it seems to me to be (it is not my own invention); and I wish I could enforce its practical teaching,—that a sense of well-being depends upon outward activities, upon training the mind not to dwell much in the contemplation of its own states but rather to project itself in practical activities under the guidance of large and constructive ideas. I would observe, for instance, that many fearful men and women seem not to have concentrated their attention sufficiently upon their work, have not allowed themselves to become engrossed in affairs. However hard-working they may be, many timid people are thinking nearly all the time in which they think at all upon the results of their efforts and about the effect upon themselves,—what will happen to them because of what they are doing, what their neighbors will think and say about them be-

cause of it, how much money they will gain, or how much they will lose, by it. Yet surely it is the work, the thing itself, that matters.

Ideas of the right sort go far to combat fear. In particular, it is profoundly true, and salutary and expedient to believe that there is nothing to be afraid of.

I sometimes think that, in discussing the *process* of evolution, we fail to some extent to realise the significance of it,—that by great pain, by great labor, by the endurance and death of men and women and children, and only so, things move on to a higher plane; that whatever happens to us and ours, the world is acquiring new and better methods and ideas and results. It is progress in general, improved life as a whole, that evolution achieves; and you and I have got to be made use of for it whether the experience be distressful or no. It is accordingly not worth while to be afraid; the only thing worth caring about is the purpose in which we are enveloped,—the large purpose that is being wrought in the world, the greater life that is coming into it, in the East and in the West; and men and women cease to be afraid in proportion as they fill their minds with the thought of it, realise the pettiness of their private affairs alongside of it, and bring their efforts into line with it.

I have tried, throughout this humble contribution to psychology, to be faithful to what I believe to be the teaching of biology; and, still in the light of it, I would conclude with the observation that, while in the animal kingdom success was bestowed upon those species which happened to be in the track of evolution, it was and is the prerogative of man to put himself there and to keep himself there. And though the force of circumstances or the malice of his neighbors may be too much for a good man in the sense that his life or his family's may be endangered or his affairs brought to disaster, the fact remains that peace of mind is oftenest the perquisite of the man who has set his life in harmony with what an enlightened judgment recognises as the providential end of human experience.

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THE FOUNDATIONS OF GEOMETRY.

THE PROBLEM OF METAGEOMETRY IS PHILOSOPHICAL.

HAVING cursorily reviewed the history of non-Euclidean geometry, which, rightly considered, is but a search for the philosophy of mathematics, I now turn to the problem itself and, in the conviction that I can offer some hints which contain its solution, I will formulate my own views in as popular language as would seem compatible with exactness. Not being a mathematician by profession I have only one excuse to offer, which is this: that I have more and more come to the conclusion that the problem is not mathematical but philosophical; and I hope that those who are competent to judge will correct me where I am mistaken.

The problem of the philosophical foundation of mathematics is closely connected with the topics of Kant's *Critique of Pure Reason.* It is the old quarrel between Empiricism and Transcendentalism. Hence our method of dealing with it will naturally be philosophical, not typically mathematical.

The proper solution can be attained only by analysing the fundamental concepts of mathematics and by tracing them to their origin. Thus alone can we know their nature as well as the field of their applicability.

We shall see that the data of mathematics are not without their premises; they are not, as the Germans say, *voraussetzungsloss*; and though mathematics is built up from nothing, the mathematician does not start with nothing. He uses mental implements, and it is they that give character to his science.

Obviously the theorem of parallel lines is one instance only of a difficulty that pops up everywhere in various forms; it is not the

disease of geometry, but a symptom of the disease. The theorem that the sum of the angles in a triangle is equal to 180 degrees; the ideas of the evenness or homaloidality of space, of the rectangularity of the square, and more remotely even the irrationality of π and of e, are all interconnected. It is not the author's intention to show their interconnection, nor to prove their interdependence. That task is the work of a mathematician. The present investigation shall be limited to the philosophical side of the problem for the sake of determining the nature of our notions of evenness, which determines both parallelism and rectangularity.

At the bottom of the difficulty there lurks the old problem of apriority, proposed by Kant and decided by him in a way which promised to give to mathematics a solid foundation in the realm of transcendental thought. And yet the transcendental method finally sent geometry away from home in search of a new domicile in the wide domain of empiricism.

Riemann, a disciple of Kant, is a transcendentalist. He starts with general notions and his arguments are deductive, leading him from the abstract down to concrete instances; but when stepping from the ethereal height of the absolute into the region of definite space-relations, he fails to find the necessary connection that characterises all *a priori* reasoning; and so he swerves into the domain of the *a posteriori* and declares that the nature of the specific features of space must be determined by experience.

The very idea seems strange to those who have been reared in traditions of the old school. An unsophisticated man, when he speaks of a straight line, means that straightness is implied thereby: and if he is told that space may be such as to render all straightest lines crooked, he will naturally be bewildered. If his metageometrical friend, with much learnedness and in sober earnest, tells him that when he sends out a ray as a straight line in a forward direction it will imperceptibly deviate and finally turn back upon his occiput, he will naturally become suspicious of the mental soundness of his company—a situation which the author can appreciate from his own experience. Having once been invited to lecture before a New Thought Club, he soon discovered to his dis-

may that all the members present, amiable though they appeared, were erratic in some way or another. They seemed quite rational on the surface, but were ready to switch off, each one on his own hobby. A man trained in Euclidean geometry must necessarily have the same impression when he hears the possibility of a fourth dimension or the curvature of space spoken of. Would we not dismiss these problems with a shrug, if there were not geniuses of first calibre who were committed to the notion that we have to suspend our judgment until we find out by experience (perhaps by experiment) what the nature of space really is?

One thing is sure, however: if there is anything wrong with metageometry, the fault lies not in its mathematical portion but must be sought for in its philosophical foundation, and it is this problem to which the following pages are devoted.

While we propose to attack the problem as a philosophical question, we hope that the solution will prove acceptable to mathematicians.

TRANSCENDENTALISM AND EMPIRICISM.

In philosophy we have the old contrast between the empiricist and transcendentalist schools. The former derive everything from experience, the latter insist that experience depends upon notions not derived from experience—called transcendental which are *a priori*. The former found their representative thinkers in Locke, Hume, and John Stuart Mill, the latter was perfected by Kant. Kant established the existence of notions of the *a priori* on a solid basis asserting their universality and necessity, but he no longer identified the *a priori* with innate ideas. He granted that much to empiricism, stating that all knowledge begins with experience and that experience rouses in our mind the *a priori* which is characteristic of mind. Mill went so far as to deny altogether necessity and universality, claiming that on some other planet 2×2 might be 5. French positivism, represented by Comte and Littré, follows the lead of Mill and thus ends in agnosticism, and the same result was reached in England by Herbert Spencer.

The way which we propose to take may be characterised as

the New Positivism. We take our stand upon the facts of experience and establish upon the systematised formal features of our experience a new conception of the *a priori*, recognising the universality and necessity of formal laws but rejecting Kant's transcendental idealism. The *a priori* is not deducible from the sensory elements of our sensations, but we trace it in the formal features of experience. It is the result of abstraction and systematisation. Thus we establish methods of dealing with experience (commonly called Pure Reason) which is possessed of universal validity, implying logical necessity.

The New Positivism is a further development of philosophic thought which combines the merits of both schools, the Transcendentalists and Empiricists, in a higher unity, discarding at the same time their aberrations. In this way it becomes possible to gain a firm basis upon the secure ground of facts, according to the principle of positivism, and yet to preserve a method established by a study of the purely formal, which will not end in nescience (the ideal of agnosticism) but justify science, and thus establishes the philosophy of science.[1]

It is from this standpoint of the philosophy of science that we propose to investigate the problem of the foundation of geometry.

THE A PRIORI AND THE PURELY FORMAL.

A priori means "beforehand," and *a posteriori* "afterwards." The bulk of our knowledge is from experience, i. e., we know things after having become acquainted with them. Our knowledge of things is *a posteriori*. If we want to know whether sugar is sweet, we must taste it. If we had not done so, and if no one had tasted it, we could not know it. But there is another kind of knowledge which we do not find out by experience, but by reflection. If I

[1] We have treated the philosophical problem of the *a priori* at full length in a discussion of Kant's *Prolegomena*. See the author's *Kant's Prolegomena*, edited in English, with an essay on Kant's Philosophy and other Supplementary Material for the study of Kant, pp. 167–240. Cf. *Fundamental Problems*, the chapters "Form and Formal Thought," pp. 26–60, and "The Old and the New Mathematics," pp. 61–73; and *Primer of Philosophy*, pp. 51–103.

want to know how much is 3×3, or $(a + b)^2$ or the angles in a regular polygon, I must compute the answer in my own mind. I need make no experiments but must perform the calculation in my own thoughts. This knowledge which is the result of pure thought is *a priori*; viz., it is generally applicable and holds good even *before* we tried it. When we begin to make experiments, we presuppose that all our *a priori* arguments, logic, arithmetic, and mathematics, will hold good.

Kant declared that the law of causation is of the same nature as arithmetical and logical truths and that, accordingly, it will have to be regarded as *a priori*. Before we make experiments, we know that every cause has its effects, and wherever there is an effect we look for its cause. Causation is not proved by, but justified through, experience.

The doctrine of the *a priori* has been much misinterpreted by Kant's followers, especially in England. Kant calls that which transcends experience in the sense that it is the condition of experience "transcendental," and comes to the conclusion that the *a priori* is transcendental. Our *a priori* notions are not derived from experience but from the conditions of experience. By experience Kant understands sense-impressions, and the sense-impressions of the outer world (which of course are *a posteriori*) are reduced to system by our transcendental notions; and thus knowledge is the product of the *a priori* and the *a posteriori*.[1]

Note here Kant's use of the word transcendental which denotes the clearest and most reliable knowledge in our economy of thought, pure logic, arithmetic, geometry. But transcendental is frequently (though erroneously) identified with "transcendent," which denotes that which transcends our knowledge and accordingly means

[1] A sense-impression becomes a perception by being regarded as the effect of a cause. The idea of causation is a transcendental notion. Without it experience would be impossible. An astronomer measures angles and determines the distance of the moon and of the sun. Experience furnishes the data, they are *a posteriori*; but his mathematical methods, the number system, and all arithmetical functions are *a priori*. He knows them before he collects the details of his investigation; and in so far as they are the condition without which his sense-impressions could not be transformed into knowledge, they are called transcendental.

"unknowable." Whatever is transcendental is, in Kantian terminology, never transcendent.

That much will suffice for an explanation of the historical meaning of the word transcendental. We must now explain the nature of the *a priori* and its source.

The *a priori* is identical with the purely formal which originates in our mind by abstraction. When we limit our attention to the purely relational, dropping all other features out of sight, we produce a field of abstraction in which we can construct purely formal combinations, such as numbers, or the ideas of types and species. Thus we create a world of pure thought which has the advantage of being applicable to any purely formal consideration of conditions, and we work out systems of numbers which, when counting, we can use as standards of reference for our experiences in practical life.

THE IMPORTANCE OF PURE FORM.

But if the sciences of pure form are built upon an abstraction from which all concrete features are omitted, are they not empty and useless verbiage?

Empty they are, that is true enough, but for all that they are of paramount significance, because they introduce us into the *sanctum sanctissimum* of the world, the intrinsic necessity of relations, and thus they become the key to all the riddles of the universe. That nothing (viz., the absence of any concrete materiality, implying a general anyness) from which we weave the fabric of the purely formal sciences is the realm in which Faust finds "the mothers" in whom Goethe personifies the Platonic ideas. They live in what Mephistopheles calls "the nothing," and Faust replies:

> "In deinem Nichts hoff' ich das All zu finden."
> ['Tis in thy Naught I hope to find the All.]

The formal sciences are in need of being supplemented by observation, by experience, by experiment; but while the mind of the investigator builds up purely formal systems of reference (such as numbers) and purely formal space-relations (such as geometry), the essential features of facts (of the objective world) are in their

turn, too, purely formal. That is to say: they are those features which make things such as they are. The suchness of the world is purely formal, and its suchness alone is of importance.

In studying the processes of nature we watch transformations, and all we can do is to trace the changes of form. Matter and energy are words which in their abstract significance have little value; they merely denote actuality in general, the one of being, the other of doing. What interests us most are the *forms* of matter and energy, how they change by transformation; and it is obvious that the famous law of the conservation of matter and energy is merely the reverse of the truth that causation is transformation. In its elements which in their totality are called matter and energy, existence remains the same, but the forms in which the elements combine change. The sum-total of the mass and the sum-total of the forces of the world can be neither increased nor diminished; they are the same to-day that they have always been and as they will remain forever.

All *a posteriori* experience is concrete, all *a priori* thought is abstract. The concrete is (at least πρὸς ἡμᾶς) incidental, haphazard, and individual, but the abstract is universal and can be used as a general rule under which all special cases may be subsumed.

The *a priori* is a mental construction, or, as Kant says, it is ideal, viz., it consists of the stuff that ideas are made of, it is mind-made. While we grant that the purely formal is ideal we insist that it is made in the domain of abstract thought, and its fundamental notions have been abstracted from experience by concentrating our attention upon the purely formal. It is, not directly but indirectly and ultimately, derived from experience. It is not derived from sense-experience but from a consideration of the relational (the purely formal) of experience. Thus it is a subjective reconstruction of objective features of experience and this reconstruction is made in such a way as to drop everything incidental and particular and retain only the general and essential features; and we gain the unspeakable advantage of creating rules or formulas which, though abstract and mind-made, apply to *any* case that can be classified in the same category.

Kant made the mistake of identifying the term "ideal" with "subjective," and thus his transcendental idealism was warped by the conclusion that our purely formal laws were not objective, but were imposed by our mind upon the objective world. Our mind (Kant said) is so constituted as to interpret all facts of experience in terms of form, as appearing in space and time, and as being subject to the law of cause and effect; but what things are in themselves we cannot know. We object to Kant's subjectivation of the purely formal and look upon form as an essential and inalienable feature of objective existence. The thinking subject is to other thinking subjects an object moving about in the objective world. Even when contemplating our own existence we must grant (to speak with Schopenhauer) that our bodily actualisation is our own object; i. e., we (each one of us as a real living creature) are as much objects as are all the other objects in the world. It is the objectified part of our self that in its inner experience abstracts from sense-experience the interrelational features of things, such as right and left, top and bottom, shape and figure and structure, succession, connection, etc. The formal adheres to the object and not to the subject, and every object (as soon as it develops in the natural way of evolution first into a feeling, and then into a thinking, being) will be able to build up *a priori* from the abstract notion of form in general the several systems of formal thought: arithmetic, geometry, algebra, logic, and the conceptions of time, space, and causality.

Accordingly all formal thought, although we grant its ideality, is fashioned from materials abstracted from the objective world, and it is therefore a matter of course that they are applicable to the objective world. They belong to the object and, when we thinking subjects beget them from our own minds, we are able to do so only because we are objects that live and move and have our being in the objective world.

UNIVERSALITY OF ANYNESS.

We know that facts are incidental and haphazard, and appear to be arbitrary; but we must not rest satisfied with single inci-

dents. We must gather enough single cases to make abstractions. Abstractions are products of the mind; they are subjective; but they have been derived from experience, and they are built up of elements that have objective significance.

The most important abstractions ever made by man are those that are purely relational. Everything from which the sensory element is entirely omitted, where the material is disregarded, is called "pure form," and the relational being a consideration neither of matter nor of force or energy, but of position, of shape, of size, of form, of relation, is called "the purely formal." The notion of the purely formal has been gained by abstraction, viz., by abstracting, i. e., singling out and retaining, the formal, and by thinking away, by cancelling, by omitting, by leaving out, all the features which have anything to do with the concrete sensory element of experience.

And what is the result?

We retain the formal element alone which is void of all concreteness, void of all materiality, void of all particularity. It is a mere nothing and a non-entity. It is emptiness. But one thing is left,—position or relation. Actuality is replaced by mere potentiality, viz., the possible conditions of *any* kind of being that is possessed of form.

The word "any" denotes a simple idea, and yet it contains a good deal of thought. Mathematics builds up construction to suit *any* condition. "Any" implies universality, and universality includes necessity.

In every concrete instance of an experience the subject-matter is the main thing with which we are concerned; but the purely formal aspect is after all the essential feature, because form determines the character of things, and thus the formal (on account of its anyness) is the key to their comprehension.

The rise of man above the animal is due to his ability to utilise the purely formal, as it revealed itself to him especially in types for classifying things as genera and species, in tracing transformations which present themselves as effects of causes, in shapes of measurable relations. The abstraction of the formal is made through the

instrumentality of language and the result is reason,—the faculty of abstract thought. Man can see the universal in the particular; in the single experiences he can trace the laws that are generally applicable to cases of the same class. He observes some instances and can describe them in a general formula so as to cover any other instance of the same kind.

If form were not an objective feature of the world in which we live, formal thought would never have originated and man could never have arisen. But if form is indeed (as we assume) an objective feature of all existence, it impresses itself in such a way upon living creatures that rational beings will naturally develop as soon as the organs of speech are perfected and social conditions produce a demand for communication which will result in the creation of language.

The marvellous advantages of reason dawned upon man like a revelation from on high, for he did not invent reason, he discovered it; and the sentiment that its blessings came to him from above, from heaven, from that power which sways the destiny of the whole universe, from the gods or from God, is as natural as it is true. The anthropoid did not seek reason: reason came to him and he became man. Man became man by the grace of God, by gradually imbibing the Logos that was with God in the beginning; and in the dawn of human evolution we can plainly see the landmark of mathematics, for the first grand step in the development of man as distinguished from the transitional forms of the anthropoid is the ability to count.

Man's distinctive characteristic remains, even to-day, reason, the faculty of purely formal thought; and the characteristic of reason is its anyness, implying apriority (i. e., beforehand-knowledge) which renders it possible that man can foresee events and adapt means to an end.

DIFFERENT DEGREES OF APRIORITY.

Kant has pointed out the kinship of all purely formal notions; and yet geometry cannot be derived from pure reason alone, but contains an additional element which imparts to its fundamental

conceptions an arbitrary appearance if we attempt to treat its deductions as rigidly *a priori*. Why should there be straight lines at all? Why is it possible that by quartering the circle we should have right angles with all their peculiarities? All these and similar notions can not be subsumed under a general formula from which we could derive it with logical necessity.

When dealing with lines we observe their extension in one direction, when dealing with planes we have two directions, when measuring solids we have three. Why can we not continue and construct bodies that extend in four directions? The limit set us by space as it positively presents itself to us seems arbitrary, and while transcendental truths are undeniable and obvious, the fundamental notions of geometry seem as stubborn as the facts of our concrete existence. Space, generally granted to be elbow-room for motion in all directions, after all appears to be a definite magnitude as much as a stone wall which shuts us in like a prison allowing us to proceed in three ways only and no more, and presenting no way of breaking through it. Verily, we might more easily shatter a rock that impedes our progress than pass into the fourth dimension. The boundary line is inexorable in its adamantine rigidity.

Considering all these unquestionable statements, is there not a great probability that space is a concrete fact as positive as the existence of material things, and not a mere form, not a mere potentiality of a general nature? Certainly Euclidean geometry contains such arbitrary elements as we should expect to meet in the realm of the *a posteriori*. No wonder that Gauss expressed "the desire that the Euclidean geometry should not be the true geometry," because "in that event we should have an absolute measure *a priori*."

Are we thus driven to the conclusion that our space-conception is not *a priori*; and if, indeed, it is not *a priori*, it must be *a posteriori!* What else can it be? *Tertium non datur*.

If we enter more deeply into the nature of the *a priori*, we shall learn that there are different kinds of apriority, and there is a difference between the logical *a priori* and the geometrical *a priori*.

Kant never investigated the source of the *a priori*. He discovered it in the mind and seemed satisfied with the notion that it is the nature of the mind to be possessed of time and space and the categories. He went no further. He never asked, how did mind originate?

Had Kant inquired into the origin of mind, he would have found that the *a priori* is woven into the texture of mind by the uniformities of experience. The uniformities of experience teach us the laws of form, and the purely formal involves "anyness," i. e., it is *a priori*.

Mind is the product of memory, and we may briefly describe its origin as follows:

Contact with the outer world produces impressions in sentient substance. The traces of these impressions are preserved (a condition which is called "memory") and they can be revived (which state is called "recollection"). Sense-impressions are different in kind and leave different traces, but those which are the same in kind, or similar, leave traces the forms of which are the same or similar; and sense-impressions of the same kind are registered in the traces having the same form. As a note of a definite pitch makes chords of the same pitch vibrate while it passes all others by, so new sense-impressions revive those traces only into which they fit, and thereby announce themselves as being the same in kind. Thus all sense-impressions are systematised according to their forms, and the result is an orderly arrangement of memories which is called "mind."

Thus mind develops through uniformities in sensation according to the laws of form. Whenever a new sense-perception registers itself mechanically and automatically in the trace to which it belongs, the event is tantamount to a logical judgment which declares that the object represented by the sense-impression belongs to the same class of objects which produced the memory traces with which it is registered.

If we abstract the interrelation of all memory-traces, omitting their contents, we have a pure system of genera and species, or the *a priori* idea of "classes and subclasses."

The *a priori*, though mind-made, is constructed of chips taken from the objective world, but our several *a priori* notions are by no means of the same nature and rigidity. The emptiest forms of pure thought are the categories, and the most rigid truths are the logical theorems, which can be represented by concentric circles.

If all *a* are *A* and if α is an *a*, then α is an *A*. If all dogs are quadrupeds and if all terriers are dogs, then terriers are quadrupeds. It is the most rigid kind of argument, and its statements are practically tautologies.

The case is different with causation. The class of abstract notions of which causation is an instance is much more complicated. No one doubts that every effect must have had its cause, but one of the keenest thinkers was in deep earnest when he doubted the possibility of proving this obvious statement. And Kant, seeing its kinship with geometry and algebra, accepted it as *a priori* and treated it as being on equal terms with mathematical axioms. Yet there is an additional element in the formula of causation which somehow disguises its *a priori* origin; and the reason is that it is not as rigidly *a priori* as are the norms of pure logic.

What is this additional element that somehow savors of the *a posteriori*?

If we contemplate the interrelation of genera and species and subspecies, we find that the categories with which we operate are at rest. They stand before us like a well arranged cabinet with several divisions and drawers, and these drawers have subdivisions and in these subdivisions we keep boxes. The cabinet is our *a priori* system of classification and we store in it our *a posteriori* impressions. If a thing is in box α, we seek for it in drawer *a* which is a subdivision of the department *A*.

How different is causation! While in logic everything is at rest, causation is not conceivable without motion. The norms of pure reason are static, the law of cause and effect is dynamic; and thus we have in the conception of cause and effect an additional element which is mobility.

Causation is the law of transformation. We have a definite system of interrelated items in which we observe a change of place.

The original situation and all detailed circumstances are the conditions; the motion that produces the change is the cause; the result or new arrangement of the parts of the whole system is the effect. Thus it appears that causation is only another version of the law of the conservation of matter and energy. The concrete items of the whole remain, in their constitutional elements, the same. No energy is lost; no particle of matter is annihilated; and the change that takes place is mere transformation.[1]

The law of causation is otherwise in the same predicament as the norms of logic. It can never be satisfactorily proved by experience. Experience justifies the *a priori* and verifies its tenets in single instances which prove true, but single instances can never demonstrate the universal and necessary validity of any *a priori* statement.

The logical *a priori* is rigidly *a priori*; it is the *a priori* of pure reason. But there is another kind of *a priori* which admits the use of some other abstract notion, mobility, which is part and parcel of the thinking mind. Our conception of cause and effect is just as ideal as our conception of genera and species. It is just as much mind-made as they are, and its intrinsic necessity and universal validity are the same. Its apriority cannot be doubted; but it is not rigidly *a priori*, it is only purely *a priori*.

We may classify all *a priori* notions under two headings and both are transcendental (viz., conditions of knowledge in their special fields): one is the *a priori* of being, the other of doing. The rigid *a priori* is passive anyness, the less rigid *a priori* is active anyness. Geometry belongs to the latter. Its fundamental concept of space is a product of active apriority; and thus we cannot derive its laws from pure logic alone.

The main difficulty of the parallel theorem and the straight line consists in our space-conception which is not derived from rationality in general, but results from our contemplation of motion. Our space-conception accordingly is not an idea of pure reason, but the product of pure activity.

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[1] See the author's *Grund, Ursache und Zweck*, Dresden, 1883.

Kant felt the difference and distinguished between pure reason and pure intuition or *Anschauung*. He did not expressly say so, but his treatment suggests the idea that we ought to distinguish between two different kinds of *a priori*. Transcendental logic, and with it all common notions of Euclid, are mere applications of the law of consistency; they are (what I call in *The Primer of Philosophy*) "rigidly *a priori*." But our pure space-conception presupposes, in addition to pure reason, our own activity, the potentiality of moving about, and thus it admits another factor which cannot be derived from pure reason alone. Hence all attempts at proving the theorem on rigidly *a priori* grounds have proved failures.

SPACE AS A SPREAD OF MOTION.

Mathematicians mean to start from nothingness, so they think away everything, but they retain their own mentality. Though even their mind is stripped of all particular notions, they retain their principles of reasoning and the privilege of moving about, and from these two sources geometry can be constructed.

The idea of causation goes one step further: it admits the notions of matter and energy, emptied of all particularity, in their form of pure generalisations. It is still *a priori*, but considerably more complicated than pure reason.

The field in which the geometrician starts is pure nothingness; but we shall learn later on that nothingness is possessed of positive qualifications. We must therefore be on our guard, and we had better inquire into the nature and origin of our nothingness.

The geometrician cancels in thought all positive existence except his own mental activity and starts moving about as a mere nothing. In other words we establish by abstraction a domain of monotonous sameness, which possesses the advantage of "anyness," i. e., an absence of particularity involving universal validity. In this field of motion we proceed to produce geometrical constructions.

The geometrician's activity is pure motion, which means that it is mere progression; the ideas of a force exerted in moving and also of resistance to be overcome are absolutely excluded.

We start moving, but whither? Before us are infinite possibilities of direction. The inexhaustibleness of chances is part of the indifference as to definiteness of determining the mode of motion (be it straight or curved). Let us start at once in all possible directions which are infinite, (a proposition which, in a way, is realised by the light), and having proceeded an infinitesimal way from the starting-point A to the points B, B_1, B_2, B_3, B_4, ... B_∞; we continue to move in infinite directions at each of these stations, reaching from B the points C, C_1, C_2, C_3, C_4, ... C_∞. From B_1 we would switch off to the points C_1^{B1}, C_2^{B1}, C_3^{B1}, C_4^{B1}, ... C_∞^{B1}, etc. until we reach from B_∞ the points $C_1^{B\infty}$, $C_2^{B\infty}$, $C_3^{B\infty}$, $C_4^{B\infty}$, ... $C_\infty^{B\infty}$, thus exhausting all the points which cluster around every B_1, B_2, B_3, B_4, ... B_∞. Thus, by moving after the fashion of the light, spreading again and again from each new point in all directions, in a medium that offers no resistance whatever, we obtain a uniform spread of light whose intensity in every point is in the inverse square of its distance from its source. Every lighted spot becomes a center of its own from which light travels on in all directions. But among these infinite directions there are rays, A, B, C . . ., i. e., lines of motion which are paths of greatest intensity. The ray of light thus ideally constructed is a representation of the straight line which, being the shortest path between the starting-point A and any other point, is the climax of directness: it is the upper limit of effectiveness and its final boundary, a *non plus ultra*. The straight line represents a climax of economy, viz., the greatest intensity on the shortest path that is reached among infinite possibilities of progression by uniformly following up all. In every ray the maximum of intensity is attained by a minimum of progression.

Our construction of motion in all directions after the fashion of light is practically pure space; but to avoid the forestalling of further implications we will call it simply the spread of motion in all directions.

The path of highest intensity in a spread of motion in all directions corresponds to the ray in an ideal conception of a spread of light, and it is equivalent to the straight line in geometry.

We purposely modify our reference to light in our construc-

tion of straight lines, for we are well aware of the fact that the notion of a ray of light as a straight line is an ideal which describes the progression of light only as it appears, not as it is. The physicist represents light as rays only when measuring its effects in reflection, etc., but when considering the nature of light, he looks upon rays as transversal oscillations of the ether. The notion of light as rays is at bottom as much an *a priori* construction as is Newton's formula of gravitation.

The construction of space as a spread of motion in all directions after the analogy of light is a summary creation of the scope of motion, and we call it "ideal space." Everything that moves about, if it develops into a thinking subject, when it forms the abstract idea of mobility, will inevitably create out of the data of its own existence the ideal "scope of motion," which is space.

When the geometrician starts to construct his figures, drawing lines and determining the position of points, etc., he tacitly presupposes the existence of a spread of motion, such as we have described. Motility is part of his equipment, and motility presupposes a field of motion, viz., space.

Space is the possibility of motion, and by ideally moving about in all possible directions the number of which is inexhaustible, we construct our notion of pure space. If we speak of space we mean this construction of our mobility. It is an *a priori* construction and is as unique as logic or arithmetic. There is but one space, and all spaces are but portions of this one construction. The problem of tridimensionality will be considered later on. Here we insist only on the objective validity of our *a priori* construction, which is the same as the objective validity of all our *a priori* constructions—of logic and arithmetic and causality, and it rests upon the same foundation. Our mathematical space omits all particularity and serves our purpose of universal application: it is founded on "anyness," and thus, within the limits of its abstraction, it holds good everywhere and under all conditions.

There is no need to find out by experience in the domain of the *a posteriori* whether pure space is curved. Anyness has no particular qualities; we create this anyness by abstraction, and it is a

matter of course that in the field of our abstraction, space will be the same throughout.

The fabric of which the purely formal is woven is an absence of concreteness. It is (so far as matter is concerned) nothing. Yet this airy nothing is a pretty tough material, just on account of its indifferent "any"-ness. Being void of particularity, it is universal; it is the same throughout, and if we proceed to build our air-castles in the domain of anyness, we shall find that considering the absence of all particularity the same construction will be the same, wherever and whenever it may be conceived.

Professor Clifford says:[1] "We *assume* that two lengths which are equal to the same length are equal to each other." But there is no "assumption" about it. The atmosphere in which our mathematical creations are begotten is sameness. Therefore the same construction is the same wherever and whenever it may be made. We consider form only; we think away all other concrete properties, both of matter and energy, mass, weight, intensity, and qualities of any kind.

UNIQUENESS OF PURE SPACE.

Our thought-forms, constructed in the realm of empty abstraction, serve as models or as systems of reference for any of our observations in the real world of sense-experience. Their anyness explains the parallelism that obtains between our models and actual experience, which was puzzling to Kant. And truly at first sight it is mystifying that a pure thought-construction can reveal to us some of the most important and deepest secrets of objective nature; but the simple solution of the mystery consists in this, that the actions of nature are determined by the same conditions of possible motions with which pure thought is confronted in its efforts to construct its models. Here as well as there we have consistency, that is to say, a thing done is uniquely determined, and, in pure thought as well as in reality, it is such as it has been made.

Our constructions are made in anyness and apply to all pos-

[1] *Loc. cit.*, p. 53.

sible instances of the kind; and thus we may as well define space as the potentiality of measuring, which presupposes moving about. Mobility granted, we can construct space as the scope of our motion in anyness. Of course we must bear in mind that our motion is in thought only and we have dropped all notions of particularity so as to leave an utter absence of force and resistance. The motor element, *qua* energy, is not taken into consideration, but we contemplate only the products of progression.

Since in the realm of pure form, thus created by abstraction, we move in a domain void of particularity, it is not an assumption (as Riemann declares in his famous inaugural dissertation), but a matter of course which follows with logical necessity, that lines are independent of position.

In actual space, position is by no means a negligible quantity. A real pyramid consisting of actual material is possessed of different qualities according to position, and the line AB, representing a path from the top of a mountain to the valley is very different from the line BA, which is the path from the valley to the top of the mountain. In Euclidean geometry $AB = BA$.

Riemann attempts to identify the mathematical space of a triple manifold with actual space and expects a proof from experience, but, properly speaking, they are radically different. In real space position is not a negligible factor, and would necessitate a fourth coördinate which has a definite relation to the plumb-line; and this fourth coördinate (which we may call a fourth dimension) suffers a constant modification of increase in inverse proportion to the square of the distance from the center of this planet of ours. It is rectilinear, yet all the plumb-lines are converging toward an inaccessible center; accordingly, they are by no means of equal value in their different parts. How different is mathematical space! It is homogeneous throughout. And it is so because we made it so by abstraction.

Pure form is a feature which is by no means a mere nonentity. Having emptied existence of all concrete actuality, and having thought away everything, we are confronted by an absolute vacancy—a zero of existence: but the zero has positive character-

istics and there is this peculiarity about the zero, that it is the mother of infinitude. The thought is so true in mathematics that it is trite. Let any number be divided by nought, the result is the infinitely great; and let nought be divided by any number, the result is the infinitely small. In thinking away everything concrete we retain with our nothingness potentiality. Potentiality is the empire of purely formal constructions, in the dim background of which lurks the phantom of infinitude.

MATHEMATICAL SPACE AND PHYSIOLOGICAL SPACE.

If we admit to our conception of space the qualities of bodies as mass, our conception of real space will become more complicated still. What we gain in concrete definiteness we lose from universality, and we can return to the general applicableness of *a priori* conditions only by dropping all concrete features and limiting our geometrical constructions to the abstract domain of pure form.

Mathematical space with its straight lines, planes, and right angles is an ideal construction. It exists in our mind only just as much as do logic and arithmetic. In the external world there are no numbers, no mathematical lines, no logarithms, no sines, tangents, nor secants. The same is true of all the formal sciences. There are no genera and species, no syllogisms, neither inductions nor deductions, running about in the world, but only concrete individuals and a concatenation of events. There are no laws that govern the motions of stars or molecules; yet there are things acting in a definite way, and their actions depend on changes in relational conditions which can be expressed in formulas. All the generalised notions of the formal sciences are mental contrivances which comprise relational features in general rules. The formulas as such are purely ideal, but the relational features which they describe are objectively real.

Thus, the space-conception of the mathematician is an ideal construction; but the ideal has objective significance. Ideal and subjective are by no means synonyms. With the help of an ideal space-conception we can acquire knowledge concerning the real

space of the objective world. Here the Newtonian law may be cited as a glaring example.

How can the subject know *a priori* anything about the object? Simply because the subject is an object moving about among objects. Mobility is a qualification of the object, and I, the thinking subject, become conscious of the general rules of motion only, because I am an object endowed with mobility. My "scope of motion" cannot be derived from the abstract idea of myself as a thinking subject, but is the product of a consideration of my mobility, generalised by omiting all particularities.

Mathematical space is *a priori* in the Kantian sense. However, it is not ready-made in our mind, it is not an innate idea, but the product of much toil and careful thought. Nor is it possible, except at a maturer age after a long development.

Physiological space is the direct and unsophisticated space-conception of our senses. It originates through experience, and is, in its way, a truer picture of actual space than mathematical space. The latter is more general, the former more concrete. In physiological space position is not indifferent, for high and low, right and left, and up and down are of great importance. Geometrically congruent figures produce (as Mach has shown) remarkably different impressions if they present themselves to the eyes in different positions.

In a geometrical plane the figures can be shoved about without suffering a change of form. If they are flopped, their inner relations remain the same, and thus they are still called congruent. Helices of opposite directions are congruent, while in actual life they would always remain mere symmetrical counterparts. So the right and the left hands considered as mere mathematical bodies are congruent, while in reality neither can take the place of the other. A glove which we may treat as a two-dimensional thing can be turned inside out, but we would need a fourth dimension to flop the hand, a three-dimensional body, into its inverted counterpart; and so long as we have no fourth dimension, the latter being a mere logical fiction, this cannot be done. Yet mathematically considered, the two hands are congruent. Why? Not because they

are actually of the same shape, but because in our mathematics position in place is excluded; the relational alone counts, and the relational is the same in both cases.

Mathematical space being an ideal construction, it is a matter of course that all mathematical problems must be settled by *a priori* operations of pure thought, and cannot be decided by external experiment or by *a posteriori* experiment.

HOMOGENEITY OF SPACE DUE TO ABSTRACTION.

When moving about, we change our place and pass by different objects. These objects too are moving; and thus our scope of motion tallies so exactly with theirs that one can be used for the computation of the other.

Space as we find it in experience is best defined as the juxtaposition of things. If there is need of distinguishing it from our ideal space-conception which is the scope of our mobility, we may call the former pure objective space, the latter pure subjective space, but, our subjective ideas being rooted in our mobility, which is a constitutional feature of our objective existence, for all practical purposes the two are the same.

But though pure space, whether its conception be established objectively or subjectively, must be accepted as the same, are we not driven to the conclusion that there are after all two different kinds of space: mathematical space, which is ideal, and physiological space, which is real? And if they are different, we must assume them to be independent of each other? What is their mutual relation?

The two spaces, the ideal construction of mathematical space and the reconstruction in our senses of the juxtaposition of things surrounding us, are different solely because they have been built up upon two different planes of abstraction; physiological space includes, and mathematical space excludes, the sensory data of juxtaposition. Physiological space admits concrete facts,—man's own upright position, gravity, perspective, etc. Mathematical space is purely formal, and to lay its foundation we have dug down to

the bed-rock of our knowledge, which is "anyness." Mathematical space is *a priori*, albeit the *a priori* of motion.

At present it is sufficient to state that the homogeneity of a mathematical space is its anyness, and its anyness is due to our construction of it in the domain of pure form, involving universality and excluding everything concrete and particular.

The idea of homogeneity in our space-conception is the tacit condition for the theorems of similarity and proportion, and also of free mobility, viz., that figures can be shoved about without suffering change, either by shrinkage or by expanse. The principle of homogeneity being admitted, we can shove figures about on any surface the curvature of which is either constant or zero. This produces either the non-Euclidean geometries of spherical, pseudo-spherical, and elliptic surfaces, or the plane geometry of Euclid—all of them *a priori* constructions made without reference to reality.

Our *a priori* constructions serve an important purpose. We use them as systems of reference. We construct *a priori* a number system, making a simple progression through a series of units which we denominate from the starting-point 0, as 1, 2, 3, 4, 5, 6, etc. These numbers are purely ideal constructions, but with their help we can count and measure and weigh the several objects of reality that confront experience; and in all cases we fall back upon our ideal number system, saying, the table has four legs; it is two and a half feet high, it weighs fifty pounds, etc. We call these modes of determination quantitative.

The element of quantitative measurement is the ideal construction of units, all of which are assumed to be discrete and equivalent. Their equivalence, as much as the homogeneity of space, is due to abstraction. In reality equivalent units do not exist any more than different parts of real space may be regarded as homogeneous. Both constructions have been made to create a domain of anyness, for the purpose of standards of reference.

EVEN BOUNDARIES AS STANDARDS OF MEASUREMENT.

Standards of reference are useful only when they are unique, and thus we cannot use any line of our spread of motion in all di-

rections, but must select one that admits of no equivocation. The only line that possesses this quality is the ray, viz., the straight line or the path of greatest intensity.

The straight line is one instance only of a whole class of similar constructions which with one name may be called "even boundaries."

Clifford, starting from objective space, constructs the plane by polishing three surfaces, *A*, *B*, and *C*, until they fit one another, which means until they are congruent.[1] His proposition leads to the same result as ours, but the essential thing is not so much (as Clifford has it) that the three planes are congruent, each to the two others, but that each plane is congruent with its own inversion. Thus, under all conditions, each one is congruent with itself. Each plane partitions the whole infinite space into two congruent halves.

Having divided space so as to make the boundary surface congruent with itself (viz., a plane), we now divide the plane (we will call it *P*) in the same way,—a process best exemplified in the folding of a sheet of paper stretched flat on the table. The crease represents a boundary congruent with itself. In contrast to curved lines, which cannot be flopped or shoved or turned without involving a change in our construction, we speak of a straight line as an even boundary.

A circle can be flopped upon itself, but it is not an even boundary congruent with itself, because the inside contents and the outside surroundings are different.

If we take a plane, represented by a piece of paper that has been evenly divided by the crease *AB*, and divide it again crosswise, say in the point *O*, by another crease *CD*, into two equal parts, we establish in the four angles round *O* a new kind of even boundary.

The bipartition results in a division of each half plane into two portions which again are congruent the one to the other; and the line in the crease *CD*, constituting, together with the first

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[1] *Common Sense of the Exact Sciences*, Appleton & Co., p. 66.

crease AB, two angles, is (like the straight line and the plane) nothing more nor less than an even boundary construction. The right angle originates by the process of halving the straight line conceived as an angle.

Let us now consider the significance of even boundaries.

A point being a mere locus in space, has no extension whatever; it is congruent with itself on account of its want of any discriminating parts. If it rotates in any direction, it makes no difference.

There is no mystery about a point's being congruent with itself in any position. It results from our conception of a point in agreement with the abstraction we have made; but when we are confronted with lines or surfaces that are congruent with themselves we believe ourselves nonplussed; yet the mystery of a straight line is not greater than that of a point.

A line which when flopped or turned in its direction remains congruent with itself is called straight, and a surface which when flopped or turned round on itself remains congruent with itself is called plane or flat.

The straight lines and the flat surfaces are, among all possible boundaries, of special importance, for a similar reason that the abstraction of pure form is so useful. In the domain of pure form we get rid of all particularity and thus establish a norm fit for universal application. In geometry straight lines and plane surfaces are the climax of simplicity; they are void of any particularity that needs further description, or would complicate the situation, and this absence of complications in their construction is their greatest recommendation. The most important point, however, is their quality of being unique. It renders them specially available for purposes of reference.

We can construct *a priori* different surfaces that are homogeneous, yielding as many different systems of geometry. Euclidean geometry is neither more nor less true than spherical or elliptic geometry; all of them are purely formal constructions, they are *a priori*, being each one on its own premises irrefutable by experience; but plane geometry is more practical for general purposes.

The question in geometry is not, as some metageometricians would have it, "Is objective space flat or curved?" but, "Is it possible to make constructions that shall be unique so as to be serviceable as standards of reference?" The former question is due to a misconception of the nature of mathematics; the latter must be answered in the affirmative. All even boundaries are unique and can therefore be used as standards of reference.

THE STRAIGHT LINE INDISPENSABLE.

Straight lines do not exist in reality. How rough are the edges of the straightest corners, and how rugged are the straightest lines drawn with instruments of precision, if measured by the standard of mathematical straightness! And if we consider the paths of motion, be they of chemical atoms or terrestrial or celestial bodies, we shall always find them to be curves of high complexity. Nevertheless the idea of the straight line is justified by experience in so far as it helps us to analyse the complex curves into their elementary factors; each one (if we go to the end of our analysis) can be represented as a straight line. Judging from the experience we have of moving bodies, we cannot doubt that if the sun's attraction of the earth (as well as that of all other celestial bodies) could be annihilated, the earth would fly off into space in a straight line. Thus the mud on carriage wheels, when spurting off, and the pebbles that are thrown with a sling, are flying in a tangential direction which would be absolutely straight were it not for the interference of the gravity of the earth, which is constantly asserting itself and modifies the straightest line into a curve.

Our idea of a straight line is suggested to us by experience when we attempt to resolve compound forces into their constituents, but it is not traceable in experience. It is a product of our method of measurement. It is a creation of our own doings, yet it is justified by the success which attends its employment.

The great question in geometry is not, whether straight line constructions are the only possible systems of space-measurement, but what is the nature of straight lines, and planes, and right an-

gles; how does their conception originate and why are they of paramount importance in geometry.

Now the fact that the straight line (as a purely mental construction) is possible cannot be denied: we use it and that should be sufficient for all practical purposes. That we can construct curves also does not invalidate the existence of straight lines.

As to the nature of the straight line and all the other notions connected therewith, we shall always be able to determine them as concepts of boundary, either reaching the utmost limit of a certain function, be it of the highest (such as ∞) or lowest measure (such as o); or dividing a whole into two congruent parts.

The utility of such boundary concepts becomes apparent when we are in need of standards for measurement. A boundary being the utmost limit is unique. There are innumerable curves, but there is only one kind of straight line. Accordingly, if we need a standard for measuring curves, we must naturally fall back upon the straight line and determine its curvature by its deviation from the straight line which represents a zero of curvature.

The straight line is the simplest of all boundary concepts. Hence its indispensableness.

If we measure a curvature we resolve the curve into infinitesimal pieces of straight lines, and then determine their change of direction. Thus we use the straight line as a reference in our measurement of curves. The simplest curve is the circle and its curvature is expressed by the reciprocal of the radius; but the radius is a straight line. It seems that we cannot escape straightness anywhere in geometry; for it is the simplest instrument for measuring distance. We may replace metric geometry by projective geometry, but what could projective geometricians do if they had not straight lines for their projections. Without them they would be in a strait indeed!

But suppose we renounce with Lobatchevski the conventional method of even boundary conceptions, especially straightness of line, and are satisfied with straightest lines, what is the result? He does not, at the same time, surrender either the principle of consistency or the assumption of the homogeneity of space, and thus he

builds up a geometry independent of the theorem of parallel lines, which would be applicable to two systems, the Euclidean of straight lines and the non-Euclidean of curved space. But the latter needs the straight line as much as the former and finds its natural limit in a sphere whose radius is infinite and whose curvature is zero. He can measure no spheric curvature without the radius, and after all he reaches the straight line in the limit of curvature. Yet it is noteworthy that in the Euclidean system the straight line is definite and π irrational, while in the non-Euclidean, π is a definite number according to the measure of curvature and the straight line becomes irrational.

EDITOR.

(TO BE CONCLUDED.)

THE RELIGIO-HISTORICAL INTERPRETATION OF THE NEW TESTAMENT.[1]

THE thesis which it is sought to demonstrate in the succeeding pages is this: That the religion of the New Testament, in important, and even in some vital, points can be interpreted only in the light of the influence of extraneous religions, and that this influence reached the men of the New Testament by way of Judaism.

What is the attitude of present-day scholarship toward the question we are discussing and toward the thesis we have set up? It has long been maintained by many scholars that certain elements in the New Testament are of foreign origin, and this is now almost universally conceded. In particular, the Logos doctrine of the Johanine Gospel has over and over again been derived from Philo, and through Philo from Greek philosophy. For some time now especial emphasis has been laid upon Greek influence, particularly, for instance, in the writings of Holtzmann. In addition to the Alexandrian philosophy, the Greek Mysteries and Gnosticism have been considered in this connection. On the other hand, much less attention has been paid to the tracing of elements of the New Testament to Oriental sources. We may cite a characteristic instance of this from Holtzmann,[2] who mentions in his study of the Apocalypse of John and the foreign elements which have of late been sought in it, the doctrine of the twelve ages of the world, which he cites as existing among Hindus, Persians, Greeks, and Jews. But he conceives of the path which this doctrine took as follows: From

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[1] Translated from the author's MS. by W. H. Carruth of the Univ. of Kansas.

[2] *Neutestamentliche Theologie*, I., p. 476.

the Hindus and the Persians it came to the Greeks, from the Greeks, under the influence of Pythagoreanism, to the Jews. It is to be noted that he quite ignores in this theory the whole Orient which lies between India and Persia proper on the one side and the peoples of the West on the other. This entire populous empire, which had been dominated from early times by the mighty Babylonian civilisation, is overlooked by him. He does not even raise the question, whether this doctrine may not have come to the Jews directly from the Orient. And yet it is possible, in this particular case, to say with tolerable certainty how this doctrine reached the Jews.

The doctrine of the twelve ages of the world, according to which the entire course of history represents a year with its twelve months, is of Babylonian origin. Babylonia is the natural home of such systems of chronology, which were originally connected with astrology. From Babylonia these chronologies spread over the whole world, to India on the east, to the Greeks and Jews on the west. But the Babylonian origin of this chronology is by no means a new discovery: it might have been noted long ago, for it is at the bottom of the system of Berosus. It is, however, a characteristic fact, that such a learned and cautious scholar as Holtzmann should have put such a wrong interpretation upon this obvious example of the influence of Babylonian civilisation on Judaism. Wernle too, in his brilliant book on *The Beginnings of our Religion*, has frequently pointed out Greek influence, but almost no Oriental influence whatever. I believe that I make no mistake in saying that a young scholar who prepares himself to-day for independent scientific investigation in the New Testament will post up on things Greek, but he will scarcely get the notion that it is necessary to be posted in the languages and history of the Orient in order to interpret the New Testament. Exception must be made of earlier and present attempts to get light from Hindu sources, which are full of difficulties from the mere circumstances of the immense geographical distance between India and Palestine, where again the existence of Babylon is ignored.

Quite recently Bousset has begun to call attention to parallels

from the Persian religion. The present writer has attempted to demonstrate the existence of certain Babylonian elements in the Apocalypse of John. It may be said that in recent years the interest in such undertakings is greatly on the increase, and yet Wernle is certainly right in saying (p. 21) that these questions have scarcely been formulated at the present day, certainly not yet answered.

REASONS FOR THE NEGLECT OF THE ORIENT IN NEW TESTAMENT STUDY.

How does it come that the religio-historical questions in the New Testament have been comparatively so little studied, and that the Orient in particular has been so little regarded in this connection? It is worth while to raise this question, not for the sake of reproaching anyone, but in order that it may be recognised that this condition has a natural reason in the development of the history of the science.

We might cite a large number of reasons. An earlier view, which prevailed for decades and has a classic representative in the *Biblische Theologie* of B. Weiss, regarded it as the proper, and indeed almost the sole, function of Biblical theology to reproduce with fidelity the utterances of the Biblical authors. This view still prevails in a large proportion of the commentaries on the New Testament. The watchword is not the interpretation, not the establishment of the historical place of a book, but only faithful reproduction.

It must be conceded that the effort has been to fulfil this task with admirable conscientiousness and a logical precision that is often astounding. But we can add, without being unjust to our predecessors, that precise reproduction and logical interpretation must be only the preparation for the real, vital, historical understanding. Yet even when the investigators—as has been done frequently for a long time past—went further and aimed at a religio-historical understanding, it was natural that the eyes of the searchers lingered longer in the sphere of Greek culture than in the Orient. For the New Testament is really a Greek book.

One who, like the author of this treatise, comes fresh from the Old Testament and considers the New Testament, is deeply impressed with the strength of the Greek influence in the New Testament. We find there, for instance, a delicacy in the use of particles, as for instance at the opening of the first epistle of Peter, "*κατὰ πρόγνωσιν θεοῦ πατρός, ἐν ἁγιασμῷ πνεύματος εἰς ὑπακοὴν καὶ ῥαντισμὸν αἵματος Ἰησοῦ Χριστοῦ*" (according to the foreknowledge of God the Father, in sanctification of the Spirit, unto obedience and sprinkling of the blood of Jesus Christ) which would have been absolutely impossible to a Palestinian Jew. And there is no doubt that this strongly Hellenistic impress in the form must be accompanied by Hellenisation in the contents.

It is not the intention in the following pages to speak of these Greek influences in the New Testament, not, however, because they are to be denied, but because the author, whose special studies deal with the Orient, would have nothing particular to offer on the subject.

Another reason for the fact that scholars have hitherto been onesided in the interest for the Greek elements involved, is that our classical education has brought Hellenism nearer to us than the Orient is. Furthermore, the specialisation of our scholarship has made it difficult for the New Testament student to obtain any acquaintance whatever with the Orient. In these days we hear from all sides the complaint that specialisation, to which on the one hand we owe such admirable results, is on the other hand a constant limitation on our fields of study. And for this reason, to help so far as in me lies to bridge the gap which separates the various branches of theological study, I undertake the treatment of the present subject. I beg the reader to consider the following investigations as a sample of the view of the New Testament obtained by an Old Testament student who gazes across the border.

The principal cause, however, that has prevented the Orient from receiving due attention in New Testament studies hitherto, is that the knowledge of the contemporary Orient, that is, of the intellectual development of the Orient in the time of the Persian and Greek dominion, is in large measure buried under the

ruins of that day. "We possess," says Ed. Meyer, "authentic contemporary records for none of the religions involved, except Judaism." "Between the older form of the Egyptian, the Babylonian, and Persian religions, and that which confronts us (chiefly in foreign garb) in Greek and Christian times, there yawns a broad gulf, which cannot be filled by native records." "From Babylon we have scarcely any religious texts whatever of the time following Nebuchadnezzar (from Persian times we have only Babylonian annals, copies of old texts, astronomical observations and chronologies, and contracts), so that it is impossible to say in this case to what extent religion may have changed and developed." As is known, Phœnician and Aramaic literature is almost wholly lost to us. The Persian, according to Ed. Meyer, who is here following Darmsteter, does not appear in documents until much later; though it is well known that the majority of authorities on Persian literature hold a different opinion: Tiele places the earliest portions of the Younger Avesta at about 800 B. C., the Gathas (the most ancient songs) several centuries earlier.[1] Those references to foreign religions which we find later in Greek, are not easily accessible to those who are not adepts in this epoch. A new world is arising before us at present out of the Egyptian papyri, but the history of later Egyptian civilisation has not yet been written. Ed. Meyer, in the third volume of his *Geschichte des Altertums*, has attempted to outline for us the status of the religions in the Persian Empire, but unfortunately his history has not yet reached the latest period. Even Hebrew archæology is wont to close with the Old Testament; we have as yet no history of the Jewish civilisation down to the time of Jesus, despite the fact that we have ample sources. Schürer has compiled very valuable data especially concerning Hellenic influence in Jewish territory.

And thus is to be explained the fact that investigators in the field of the New Testament have frequently failed altogether to take account of the Orient, for the Orient seems to be out of the current of modern investigation. Clearly enough, it is the pre-

[1] Tiele, *Geschichte der Religion*, II., p. 49.

dominance of Hellenism, and later of the Christian Church, which has thus buried out of sight the knowledge of the later Orient. But that this Orient was still alive in that period and capable of new experiences is shown by the rise of new religions which originated at the great religious solstice and in the centuries before and after: Gnosticism, which in the opinion of many recent scholars rose originally in the Orient and then flowed through the channel of Judaism into the Christian Church; Manichæism, Mandæism, Islam. But, not least of all, the vigor of the Orient is to be recognised in the fact that at this very time some of the ancient religions came again to the front,—the Egyptian, Parsi, Syrian religions and those of Asia Minor, which afterwards made their way, carried by the legions, into the Roman Empire and even to the borders of Germany and Britain. And finally this vitality is manifest in the mighty influence which the Orient exercised upon Judaism, and then, as we are about to show in what follows, upon nascent Christianity.

Furthermore, we must consider that the knowledge of the Orient is rendered extraordinarily difficult for one who is not a specialist in the field by the great number of languages involved. And thus it comes that we are obliged to draw our knowledge of the Orient in Persian and Hellenistic times in the main from footnotes and inferences. At any rate, it becomes possible to comprehend why the learning of the Orient, so imperfectly known, has thus far done so little to enrich other scientific fields.

DANGERS OF RESEARCH IN THIS FIELD.

Finally the writer would like to consider certain warnings against the dangers of research into the field of the history of religion, and this particularly because the warnings have been uttered by two such eminent and respected men as Harnack and Wellhausen. It is fair to assume that these men in their utterances have given voice to the sentiments of extensive circles.

I am least disturbed by Wellhausen's declaration[1] that the

[1] *Skizzen und Vorarbeiten*, VI., p. 233.

function of the theologian and exegete is solely to ascertain the sense which was attributed to the text by the Jewish and New Testament writers,—he is speaking especially in this connection of Apocalyptic writers. Now Wellhausen concedes that we have in fact in the Apocalypses material that is not always fully transfused with the conceptions of the author; but he maintains that it is a matter of utter indifference methodically where this material comes from. The theme of the theologian is solely the material as it appears in its last modification, the one found in the New Testament, and not at all the early history of that material. The antecedents of the material, he says, have perhaps an antiquarian interest, but none for exegesis. In such declarations Wellhausen falls into conflict with fundamental principles which are everywhere recognised in historical science, and which are conceded and followed in other fields by Wellhausen himself. The cardinal principle of historical study is this: That we are unable to comprehend a person, a period, or a thought dissociated from its antecedents, but that we can speak of a real living understanding only when we have the antecedent history. Historical understanding means an understanding built upon the historical associations. Wellhausen himself is a teacher of the first rank in this historical method.

Accordingly, when it is admitted that the material of the Apocalypses really has a history, science will on no condition resign its right of investigating this history, and the conviction must prevail that this investigation has not merely a "certain antiquarian" interest, but rather that the results are indispensable preliminaries to any true and living understanding of the subject. Wellhausen's position on this question would be quite inexplicable, this must be said frankly, but for the assumption that in these general assertions of his he is expressing a personal disinclination to enter upon such investigations.

On the other hand, there is no denying that there is perhaps a danger here,—the danger that in these investigations of the early history the subject proper may be forgotten. The study of the New Testament itself is and must remain the proper subject of New Testament research. Not the "eternal yesterday," but the

eternal present! The whole stress should be laid upon the task of attaining a spiritual comprehension of the eternal present that has developed from the eternal past. If in the following brief studies this task is not fully accomplished, the writer begs his readers not to interpret the failure as signifying that this final goal is not steadily before his eyes. He ventures to refer for confirmation of his attitude in the matter to his other writings, especially his *Commentary on Genesis* and his *Creation and Chaos*, in which he has attempted to do justice to this task. But in the questions that are to be treated in the following pages, in which our religio-historical research is still in its beginnings, and especially in these lines which attempt to condense in brief an enormous material, we can expect only to call attention to certain points which have a religio-historical significance. If this beginning is correct, there need be no fear that the rest will follow of itself.

Another danger in connection with the history of religion would be that of forgetting in our scholastic zeal the great personages concerned. For this is the great question which tests all historians of our day: whether persons or tendencies constitute history. Formerly, and not so very long ago either, the danger was, ignoring historical tendencies; now in our socialistic age it is, overlooking persons. There is no universal rule for the case. On the contrary, history shows a remarkable and highly varied complex of the two factors. I take pleasure in testifying that I first learned to observe this fluctuant play of the interaction of persons and periods in Harnack's lectures. Religio-historical investigations are concerned preëminently, as a matter of course, with periods and tendencies. But such investigations do not need to be utterly blind to the importance of individuals. We can do the one without omitting the other. Who, for instance, could be so lacking in insight as to be able to deny the all-surpassing greatness of, let us say, Paul, not to speak of Jesus! And under no circumstances may we speak of "estimating"[1] individuals! Every individual, however humble,

[1] The word "estimate" translates the German "*verrechnen*," which here means "to compute in detail" or "to reduce to figures," i. e., "to calculate," an expression used by Harnack.

has his mystery, which we may perhaps transcribe, but not "estimate."

Here also we may await with confidence the further development of religio-historical scholarship. And if occasionally in the mind of an ill-balanced or immature person the great heroes of religion should sink into the shade, surely they are themselves great enough to furnish promptly the corrective of this error. In the end, our religio-historical research will only lead to a better understanding of the great personages. And once more I beg the reader not to expect that these few lines will point him the whole distance to the individuals. Here, where we are engaged in laying foundations, this last achievement can find no place, or at least only by way of suggestion.

Again, Harnack has warned us not to lay too much stress on "arabesques." In every great historical religion there are to be found, along with the living thoughts, all sorts of incidental material from antiquity that may be compared with the decorations of a work of art. True scholarship, which knows how to recognise the just proportions of greatness, lays all the stress on the vital thoughts. Yet on the other hand, the investigation even of arabesques has a certain value, for it is our object to become acquainted with the historical phenomenon not only in its chief features, but as a whole, even in its corners and side passages. Moreover, it would not be unheard of in the modern study of the New Testament to devote attention to trifles, and often the investigation of such petty ornaments has an especial significance. One who is occupied in the excavation of an ancient building, the origin of which he does not know, will not regard it as lacking significance if he finds exclusively Gothic ornaments, for he will infer from them that the whole structure was built in the Gothic style. Thus we infer from the ornaments of Phœnician art that have been preserved that the whole Phœnician civilisation rested upon a combination of Babylonian and Egyptian civilisations. Accordingly we are justified if at present, when we are just beginning the religio-historical investigation of the New Testament, we begin with seeming trifles. "Despise not the day of small things." However, we will accept

Harnack's warning not to linger too long over trifles, but pass, as soon as ever possible, to things of greater moment.

SKETCH OF LATE ORIENTAL RELIGIONS.

What we now have to offer is the evidence that certain points of the New Testament are of foreign origin.

We must begin with a general sketch of the condition of Oriental nations, and especially of the religions of the Persian and the Greek empires.[1] In the introduction to Church history we are accustomed to explain that there was in the Roman Empire a tremendous intermingling of races and accordingly also a remarkable blending of religions. The same conditions had prevailed in the Orient several centuries earlier. The power of the many great and small races and of the national states and civilisations had already been broken down by the arms of the Assyrians. The nations having grown used to the foreign yoke submitted almost without resistance to the conqueror of the hour. Secure highways in prolonged periods of peace promote increased international commerce. Races mingle, partly as a result of the compulsory regulations of the conquerors, such as deportation, and partly on the paths of commerce: in all the great Oriental cities there are foreign colonies; as early as the seventh century B. C. there were already five Canaanite cities in Egypt (Isaiah xix.). In a Minæan (South Arabian) inscription incidental mention is made of the nationality of the female slaves who were dedicated to the gods: they came from Egypt, Ammon, Moab, Dedan, Quedar, and Gaza. In this commingling of races customs are levelled. All nations participate in the common civilisation of Southwestern Asia. "Of all nations," says Herodotus, "the Persians most easily adopt foreign customs." In the Persian Empire this civilisation employs the Aramaic language. As early as the Assyrian times Aramaic had become the language of trade and of international diplomacy; in the Persian Empire it was the official language of the Persian representatives even far beyond the borders of the Semitic world, even in Asia Minor and

[1] See Ed. Meyer, *Geschichte des Altertums*, III.

the Troad. The Aramaic writing made its way during the Persian dominion into the western portions of India. And finally entire populations adopted the Aramaic language; such was the case in Palestine, Phœnicia, and Babylonia, while in Arabia the Aramaic even became the literary language. This development is paralleled by the process which latinised Gaul, Spain and North Africa under the Roman Empire. In the age of Greek dominion Greek civilisation overspread the Orient, but the Aramaic persisted as a substratum.

In these times of general race-mingling the ancient religions, too, suffered disintegration. Religions lost their former political environment and began to surrender their distinctively national features. Formerly the concern of the state and the whole people, religion now became the affair of the individual. The merchant, the mechanic, the soldier, the slave, each takes his religion with him into foreign parts and there makes propaganda for it. Thus religions were transplanted, various religions were mingled, and native religions became loaded with foreign elements. In that age Babylonian gods were met with in Edessa, in Bambouk, in Palmyra and in Sidon. In the Arabian emporium of Taima there are inscriptions in the Aramaic literary dialect; on them the Arabian god wears Assyrian garments and an Assyrian beard, but a quasi-Egyptian helmet; above him is seen the southwest-Asiatic (Syro-Phœnician) modification of the winged sun-disc derived from the Egyptians; the priest and the image of the god are of Egyptian origin.

The king of Byblos appears in Persian garb and with Persian beard before the tutelary goddess of the city who is represented like an Egyptian. In Commagene the Greek deities were identified with the Persian: Zeus with Ahuramazda, Herakles and Ares with Artagnes, etc. A characteristic example from a later period is offered by an Egyptian relief from the Roman Empire, representing Horus mounted on horseback and striking down the crocodile with a lance. In this, the hawklike head of the god is Egyptian, while the mounting of the god on horseback is entirely un-Egyptian: the latter feature being rather in consonance with a Persian

representation of the serpent-slayer, which is preserved. The garb of the god is that of a Roman general. And this figure is the prototype of our St. George! (Roscher's *Lexikon*, article "Horus" by Ed. Meyer.)

The aforementioned modification of the winged sun-disc, which is derived from Egypt, and which the Assyrians took over from the Syro-Phœnician civilisation and selected as a symbol of their national deity Assur, was in its turn adopted by the Persians as a symbol of their god: Babylonian elements in the Persian civilisation are: the seven planets as the rulers of destiny, strange-shaped hybrid beings often found on Persian seals; the belief that certain spirits have charge of the twelve months, and of every day, or even of every period of the day, etc.

Thus do religions begin to resemble one another even in content. For instance, the belief that there is a proper time for everything, which the adept can figure out, a belief which is primarily of Babylonian origin; furthermore, the belief in seven supreme divinities; certain myths, such as that of the struggle of the god of light with the monster of chaos; sorcery, eschatology, the doctrine of immortality,—all these spread in that period over the entire Orient.

GNOSTICISM AND MANDÆISM.

In a later period in the Orient we see new organisations, the beginnings of which we may place in the opening of the Greek era. We usually make our first acquaintance with these organisations when they carry their propaganda over upon Greco-Roman territory. We do not know at present where and when they arose in the Orient, but we can designate them by a name that was used in these circles esoterically, as Gnostics (Mandæans). These organisations are exceedingly various in nature, and very complex in structure: they are the product of the great commingling of religions and had extensive reciprocal influences. The earlier Mandæan religion, according to the opinion of W. Brandt,[1] is founded

[1] Brandt, *Mandæische Schriften*, P. XII ff.

upon Parsi, Babylonian and Jewish elements. At the beginning of the second century A. D., Mandæism adopted certain Christian elements, the intermediaries being Christian Gnostics. In the third and fourth centuries there were introduced on the one hand the Parsi doctrine of the opposition of the spheres of light and darkness, and on the other Christian monotheism, and with this there arose a bitter hostility between Mandæism and Catholic Christianity.

A similar picture is represented by the Mithraic religion, which is related to the organisations just described. According to Cumont[1] the lowermost and most primitive stratum in the Mithraic religion is of Iranian origin; in Babylonia there was spread upon this a heavy deposit of Semitic doctrines; in Asia Minor the local cultus modified this somewhat; and finally Hellenic civilisation put its glossy varnish over the whole.

Now, varied as these "Gnostic" organisations are, and few as are the sources which we have for the study of the earlier pre-Christian and pre-Jewish Gnosticism, yet we are enabled by retro-reference from the later forms to obtain an approximate notion of the earlier period. In the following we give a sketch which sums up especially those features in which earlier Mandæism and Gnosticism agree. Most characteristic feature of all is the pessimism which laid hold of the old and decadent races. It seemed to them that this world was in a bad way; man longed to escape from this transitory world to a better life, to the immortality of the serene gods.

Corresponding to this pessimistic ground tone was the division of the universe into an upper realm of light, the realm of the good, and an under world of darkness, the realm of the evil powers; the earth, a mixture of the two, lies midway between them. Myths relate how this earth arose as a mixture of good and bad. Man himself belongs to both spheres: his soul to the upper, his body to the lower. The ambition of the human heart is, freed from this earth and all things corporeal, to pass through the range of heavens

[1] In Roscher's *Lexikon*, article "Mithra"; also Cumont's articles on Mithra in *The Open Court* for March and April, 1902.

which rise one above the other, into the presence of the supreme God, there to dwell forever. To such an immortality does man attain after death, if in this life he has been initiated into the secret rites and knows the names which procure him entrance to the heavens. In order to impart these rites to men, and to break down the powers of darkness, one of the higher gods, the divine Saviour himself, descended into the lower realms of the universe.

This religion existed in the form of secret sects. The national religions at that time had outlived their usefulness; they were no longer able to satisfy the deepest needs of the men of that day. But those of like mind gathered in secret brotherhoods; the Orient must have been full of these secret sects, a condition corresponding to that of the multitude of petty states in former times. A characteristic of these brotherhoods is that they offered no sacrifices,—the human mind had emancipated itself from that,—but they celebrated a multitude of sacraments: ablutions, crowning with wreaths, anointing, water-drinking, bread-eating, etc. The dualistic sentiment leads naturally to asceticism. These religions are derived from polytheism, and consequently are familiar with a multitude of divine beings. But on the other hand, these are no longer the ancient national divinities, or at least they are reduced to lesser dignity (in Mandæism the seven great Babylonian deities are but subordinate beings, although they are still the lords of this world). And it is especially notable that the adherents of these sects, instead of designating the persons of the gods by proper names, prefer to characterise them with abstract titles: Life, Light, the Word of Life, Wisdom, Knowledge. A mark of the vocabulary of the secret sects is that they employ common words of daily life in peculiar technical meanings, in order to preserve their mysteries; thus in Mandæism the æons are named with such words as "doors," "houses," "the grapevine," etc. Or they used mysterious combinations, as "the water of life," "the second death," "the great light," "the first man," etc. These are some of the simple elements of Gnosticism as it must have prevailed from the Euphrates to the Mediterranean in the time of the great religious solstice.

RELATION OF JUDAISM TO LATER ORIENTAL RELIGIONS.

We come now to the position of Judaism in this Oriental world. For some time before the Babylonian Exile Israel had ceased to be a people with a wholly independent, autochthonous civilisation; it had been filled with alien material for a long time. At present the more the once unknown world of the Orient becomes familiar to us, the more clearly do we see how great the influence of neighboring nations was upon Israel, and especially that of Babylon; or at least, we might see it, for the willingness of scholars to enter upon such religio-historical investigations in the Old Testament field is none too great. There are a number of fields which are touched by this foreign influence upon Israel, the one in which we can at present see most clearly being that of the myths of creation.

For the study of the New Testament also it is not without a certain value to become acquainted with these Old Testament investigations; first, because conditions are more clearly defined in the Old Testament, and secondly, because we are in part dealing with the same elements which from the earliest times down to the New Testament period have again and again influenced Israel from foreign countries. Of all these many groups of elements the most important is a field that has thus far scarcely been mentioned in this connection, that of eschatology. The eschatology of the prophets and psalmists is in its way strongly Israelitic in appearance: it deals with Israel and Yahveh; yet to a large extent it employs images and conceptions that involve the destruction of the universe and the development of a new world, images which are mythological in their nature and cannot have originated on Israelitic soil. Thus we hear of enormous world-catastrophes, of a great world-storm, of a world-conflagration, of an immense deluge, terrible hosts of horsemen dash down upon the world from the North, the monsters of the deep get loose, a new Chaos will ensue. But then a new day will break; God will create a new heaven and a new earth; on earth a new Golden Age will begin, and even in Hades

the light of the divinity will be seen. In many passages it is perfectly clear that we are dealing here with primitive myths of creation, which have taken on a new eschatological significance: at the end of time there will come about what actually was at the beginning.

That these eschatological features are actually of mythological origin, and are based specifically upon a transference of myths of origin to the end of the world, is clearly seen from such a passage as Jeremiah iv. 23 ff., where the coming destruction is named with the primitive word *tohu vabohu*, and again from the description of the coming reign of peace among the animals, Isaiah xi. 6 ff., where the primitive myth of the Golden Age is transferred to the end of time, and finally and particularly, from all those passages in which recurs as a prophecy the primitive myth of the dominion of the sea and its dragons over the world. Such mythological elements appear with increasing clearness in the later and the latest times; in the earlier times they are less numerous and at the same time of a more strongly Israelitic type. But they are present from the beginning: even Isaiah speaks of the approaching roar of the floods and of their sudden expulsion by the thunder of Yahveh's speech at the beginning of the new day (Isaiah xvii).

Thus we see how for centuries a foreign mythological eschatology was streaming into Israel, contributing to Israelitish prophecy its impulse, its temper, and an abundance of material. As long as the Israelitic religion was in its vigor, it assimilated actively this foreign material; in later times, when religion had become relaxed in strength, it swallowed foreign elements feathers and all. Accordingly it must be our method in these matters to interpret the descriptions of the early prophets, which are often almost unrecognisable as regards their origin, in the light of the much clearer writings of the later prophets and the Apocalypses. The figure of the Messiah itself is found among this originally mythical material. It is true, the new David or son of David whom the prophets expect is only a human being, although endowed with divine powers, and the hope that such a king would arise and bring joy to Israel is at first purely national. And yet there are some features in this

royal figure which lead to the conclusion that the expected king was originally a divine king. Even in Isaiah (Chap. ix) he receives titles which really do not belong to a human being: Mighty God, Everlasting Father; in Isaiah xi. he is the king of the Golden Age in which the wolf and the lamb shall lie down together; and it is particularly noticeable that in several passages his birth is celebrated in mysterious language and the salvation of Israel is hoped for as a result: a human child just born cannot be of aid to his people, but it is different with a divine child! It is to be observed also that other prophets and many psalmists also speak of a god who shall become king of the whole world; this is Yahveh whose coronation and ascent into heaven in the end of days are particularly alluded to by the psalmists. The whole material takes shape most perfectly if we assume that there is at the base of the Israelitic hope for a king an alien and mythical hope, in accordance with which a new god shall ascend the throne of the world as king. And accordingly we are not at all surprised when in the later Apocalypses we meet a celestial figure, who is some time to descend upon earth and here establish a kingdom of bliss. This figure is no new creation of Apocalyptic Judaism, but it is the same figure which is in the background of the prophetic expectations.

Thus, then, we see by an example that the Israelitic religion had already received very strong influences from foreign countries even before the Exile. And as a result of the Exile these foreign influences upon Judaism became very much stronger. The people, separated from their home, without political life, under alien governors, as time passed scattered more and more over the whole earth, lost a great part of its national character; it adapted itself to Aramaic civilisation; it gradually learned a new calling (that of merchant), a new written character, a new calendar, new weights and measures, and even, finally, a new language. This whole modification was about completed in the time of Jesus. By that time the Jews had really become another nationality: from being a tribe of Israel, it had been changed into an Aramaic religious community.

The Exile, then, marks a decisive epoch in the development

of Jewish civilisation; of their native national life there was retained in permanence only such elements as were closely related to religion. For religion offered the strongest possible opposition to the danger of denationalisation which was at that time clearly impending. We know from the demonstrations of Wellhausen that the great religious reform which determined the future tendency of Judaism, the reform of the Priestly Code, was introduced at that time. Judaism, in imminent danger of sinking out of sight in the maelstrom of races, gathered all its forces together and determined to exclude as far as possible all foreign influences. And thus the first condition that is revealed to us after the Exile is a surprising one: Judaism, which in all other fields was growing every day more Aramaic, is preserving its religion on the whole undefiled. And yet we must bear in mind that underneath the official exclusive current there ran a current of syncretism from which now and then fragments come to the surface. Thus we see in that period among the new acquisitions especially eschatology with its constant tendency to grow more mythological; a documentary evidence of this undercurrent of syncretism is seen especially in the Book of Zechariah, in which is to be found an abundance of originally mythological material.

JUDAISM IN THE CENTURY BEFORE CHRIST.

At the beginning of the second century before Christ the power of Judaism, which had been languishing constantly under the foreign yoke and the wretched social conditions, seemed to be exhausted. Let the reader turn to the last Psalms, the last Prophets, to Jesus Sirach and to Chronicles, in order to realise how the religious vigor is relaxing in every field. But the insane attempt of Antiochus to paganise Judaism by force renewed its life. The Church community, forced into a life and death struggle, rose with a mighty effort. A new epoch began with the rebellion of the Maccabees. It is evident that new social elements entered at that time into the history of the people and its religion, and therewith new thoughts came to the surface. This is the second, and for us the

more important, period of Judaism, for out of the womb of this regenerated Judaism did Christianity come to the light.

The learning of the scribes was by no means extinguished at that time, but on the contrary experienced a new revival. Pharisaism was one of the dominant powers of the period; but the popular impression that Pharisaism was ultimately the one exclusively valid and characteristic manifestation of the Judaism of that epoch is untenable. Pharisaism assumed the exclusive lead only after the excision of Christianity and after the great conflicts with the Romans under Titus and Hadrian, when again a new epoch begins. In the earlier period Judaism was more richly developed. Here were to be found along with the learning of the scribes other tendencies with which the Apocalypses are connected, tendencies that inflamed the people to attempts at rebellion, which produced men who came forward with the claim that they were prophets or even the promised Christ himself. All the Apocalypses claim to be cryptographs and reproduce traditional mysteries. Accordingly we must presume that there existed at that day certain circles which employed these mysteries for their edification and which avoided publicity. It is from this period that we learn of the secret league of the Essenes. The secret traditions of the Apocalypses deal especially with eschatology, angelology, and cosmology. And this is the very point at which foreign elements entered Judaism in full stream. The new cosmology, the doctrine of the seven heavens, of the supermundane paradise, of hell, and of the other mysterious regions of the world; the division of the world into the realm of light which is God's, and the realm of darkness, ruled over by Satan; the extraordinarily developed angelology, which is nothing else than a sort of reduced polytheism; the new eschatology, which wholly rejects this world as being full of sin and misery, and looks forward to a new one, and which expects to see a Messiah coming in the clouds of heaven:—this entire and various mass of material is not of Jewish origin, although it is strongly tinged with Judaism in the form preserved to us. It is only necessary to read a prophet or a psalmist and follow this up with the book of Enoch in order to appreciate the tremendous difference. The greater part of all

that constitutes this difference does not appeal to us. Incontestably there was at that time danger that religion might be stifled beneath the weight of this grotesque and barbaric mysticism; and yet we must not ignore the fact that a new life was stirring beneath these peculiar forms. For that epoch contained in these fragile vessels a very precious treasure, the doctrine of the resurrection. The doctrine of the resurrection is not, as was formerly quite commonly maintained, and is even now maintained to some extent, the product of Judaism, but it was imported from a far country.

SOURCE OF THE DOCTRINE OF THE RESURRECTION.

In view of the immeasurable significance which this doctrine has for the understanding of the New Testament, it seems proper to linger over the subject. In order to derive the origin of this belief from unperverted Judaism, the Old Testament narratives of the translation of Enoch and Elias have been cited, but without warrant; for we are different from Enoch and Elias. No person, be he ever so pious, dreams of expecting the destiny of these heroes in his own case. Or again, certain passages in the Psalms have been quoted, according to which God will save the souls of the pious from the grave. But what the faithful expects in this connection is not the resurrection from the dead, but rather something very different, namely that God will save him in present danger and not permit his soul to go down into sheol (the grave). Neither did this belief come from the familiar passage in Job (xix. 25): Job thinks for a moment of the possibility that God may justify him even after death. But this belief plays but a transient rôle in the body of the book; and withal such a world-stirring thought does not take its origin from a single passage in the Bible, but rather from a profound necessity of the human heart.

We meet the belief in the resurrection for the first time in Daniel vii., where the resurrection of certain saints and certain sinners is expected. Accordingly, it is commonly declared that the belief in the resurrection is a product of the age of the Maccabees: in this terrible crisis, when so many martyrs perished, people comforted themselves with the hope that they would necessarily be re-

warded after death, and later this belief became general. But this too is but a superficial attempt to trace the origin of the belief.

Great things do not arise by chance, but have always great causes. And the belief in the resurrection of the dead is one of the greatest things in the whole history of religion. With the introduction of this doctrine there has resulted a great alteration in the depths of the religious consciousness; the whole world stands thenceforth in another light. The ancient religion of Israel had stood with both feet planted upon this earth; what it had desired of its God was first of all the goods of this world, whereas the new age learned ever more and more to despise the goods of this world and to reach out for the supernatural. The dark side of this faith in another world is a strongly pessimistic judgment of the present. When men began to despair of this world, religion threw itself with all its might into the world to come.

The belief in the resurrection arose from the longing of the human soul which cannot be satisfied with the common destiny of death, but longs to get away from this world of weakness and transitoriness into a new, blissful and imperishable life. Since this belief entered into religion, everything is changed; the day about which all religious meditation centers is the day of judgment; the great question which appeals to every individual is: Will you be one of those who will be justified in that day and who will inherit eternal life, or will you be condemned? What immense significance this belief assumed for practical religion may be observed in iv. Ezra, in Paul, or in the Gospels. This significance of the belief in the resurrection is so great that we may accordingly divide the whole history of the Jewish-Christian religion into two periods.

A belief of this immense importance does not take its rise from the generalisation of a single passage in the Bible, but must have much deeper and more potent causes. How then did this belief come into Judaism? Without doubt Judaism was at that time prepared for the belief by its individualism and its increasing pessimism; if it had not been prepared, it would scarcely have laid hold of it so eagerly. And yet, it did not originate the belief; we cannot find its origins in Judaism, but all at once it is there, and it

comes along with a new cosmology, with the conceptions of a supernatural paradise and of the fiery pit of hell. It is very evident from these accompanying conceptions that it comes from the Orient. Indeed, we may go further. The comparison of the transfigured body of the blessed with the stars, with the aural bodies of the angels, which are so very frequent in late Judaism and in the New Testament, show us that this belief was brought to Judaism from a stellar religion in which it was the ideal of the faithful to be snatched away from the transitoriness of the earth and to become like unto the ever-beaming divine stars. This postulate which is derived exclusively from the observation of Judaism, is abundantly confirmed by what we know of the contemporary religions of the Orient. It is well known that the belief in life after death has long been present in a number of Oriental religions, for example, the Egyptian and the Persian, and that the whole Orient was filled with it at the time of which we are speaking. It is not remarkable that Judaism also finally adopts this belief, but rather is it strange that it resisted the belief so long.

JUDAISM A SYNCRETIC RELIGION.

If we survey the entire, almost boundless, field of the whole mass of the material that was adopted by Judaism at that time, we may say without exaggeration that the Judaism of certain schools must frankly be called a syncretic religion. Notably in the exceedingly pronounced angelology, polytheistic or in some cases dualistic tendencies have insinuated themselves into the monotheism, thus differentiating this Judaism most decidedly from the classic religion of the prophets and the psalms. Now we must suppose that different circles assumed very different attitudes toward all these new notions: the Sadducees, who, we are told, do not believe in angels and deny the resurrection from the dead, assume an unfavorable attitude; the Apocalypses are saturated with it; Pharisaism occupies a middle ground. But certain notions, such as the belief in the resurrection, become common property even of the populace which has no theological bias. And so the age of Jesus presents a remarkable picture: Judaism is most strongly influenced from two

opposite sides,—among the Jews of the Dispersion in the West especially by Hellenism, and among the Jews of the Eastern dispersion and in Palestine chiefly by the Orient.

CHRISTIANITY A SYNCRETIC RELIGION.

In what has preceded we have attempted to present a picture of syncretic Judaism in the age of Jesus. It was necessary to make this characterisation somewhat detailed, because otherwise the propositions that are to follow would seem to be floating in the air. For what is to follow our thesis is: That Christianity, which was born of syncretic Judaism, has strong syncretic features. Primitive Christianity, which resembles a river, sprang from two main sources: the one comes from the Old Testament, and the other by the way of Judaism from alien Oriental religions. And to these is to be added in the Occident the Greek factor. And here let it be expressly emphasised, that we make a pronounced distinction between the Gospels and Christianity, and that the following paragraphs will speak only of Christianity, that is, the religion of the first Christian congregations, not of the Gospel, that is, of the message of Jesus himself.

Furthermore, it is to be borne in mind that the religion which influenced Judaism from the time of the Maccabees, and elements of which now once more came into the light of history in Christianity, has not yet been named. But surely we shall make no mistake if we assume that it is the same religion which developed later in Mandæism and Gnosticism; yet it would unnecessarily burden our argument if we were to lay the chief stress on this fact. In any case, we shall abstain in what follows—at least with a few exceptions—from pursuing the history of this religion further back and distinguishing in it the Babylonian, the Persian and the Egyptian elements. All this is of secondary interest for the investigator of Judaism and especially for the student of the New Testament. For him it is of first importance to recognise that certain elements of the Jewish and Christian religions are borrowed, and to determine the primitive character of these alien elements. But this is all very possible merely from the sources of the Old Testament, of

Judaism and of the New Testament which are accessible to the Bible student. If we limit thus the material with which we are to work, we have the advantage of dealing with a subject that is accessible and distinct, and upon the basis of which we can therefore make tolerably certain inferences.

The course we are to pursue in the succeeding pages is as follows: We shall assume that we arrive at the New Testament from the Old Testament by way of Judaism. We are already prepared to see much that is new in Judaism that is not found in the Old Testament and is by no means anticipated there. But now we arrive at the New Testament, and we are astonished to meet there an abundance of new elements which strike us as very peculiar. They are by no means from the Old Testament; indeed they are opposed in some vital points to the deepest religious sentiments of the Old Testament, to the religion of the prophets and the psalmists. By many evidences we recognise that these elements do not come from the great personages who created the primitive Christian religion, although as a matter of course they passed through the mind of these personages and were thus re-coined. How, then, shall we account for the origin of these elements? We shall understand when we examine their nature.

Among the characteristics of the religion of the Old Testament religion are monotheism and the aversion to all that is mythical; while in contrast with this the most distinct mark of what is not primitively Jewish is the leaning to polytheistic conceptions and to the mythical. Accordingly, one who wishes to undertake such investigations must first of all have a clear conception of the nature of the mythical, and must have his powers of observation trained by the study of mythical subjects from the Orient. In this connection the Babylonian myths of creation are especially instructive, or the later Gnostic myths of the Mandæans. With this preparation he will be able after careful consideration to recognise even in the New Testament elements which have the mythical trace about them. Here, then, one must have the courage to surrender oneself to the impression made by the subjects, and to try by keenness of ear to detect the inmost nature of the elements involved. By

depending upon these negative and positive evidences, we shall be able to designate certain elements as characteristically of Old Testament origin. Then the further question may be permitted, where these notions come from in their last analysis. Of course, this method cannot be followed out for every detail in what follows, but we shall resort sometimes to a somewhat condensed process. But only by pursuing this method in general can we arrive at positive results.

THE APOCALYPSE OF JOHN.

We shall begin with the Apocalypse of John, although this book represents only a side-line within the entire field of the New Testament, and within the Apocalypse we shall take up only certain elements of the Apocalyptic material, although these are, for the Christian student of the Apocalypse, only on the periphery of his religion. It should be expressly emphasised here that we are now dealing with features that are more or less foreign to true religion. Yet despite this fact, it seems to be necessary to begin at this point, because we are able to see here with especial distinctness. One who is not convinced at this point will surely not regard as conclusive the evidence which is to follow.

The author has already treated in his *Schöpfung und Chaos* some of the points referred to in what follows. He may therefore regard this essay as a continuation of that work. However, the points already treated will be dealt with but briefly, and yet they could not be entirely omitted, because the author cannot assume that his position on these points is generally known, and because an opportunity is thus offered to refer, though it be but briefly, to the objections that have been expressed since the appearance of the above-mentioned book, especially those of Wellhausen. These investigations in the Apocalypse of John are continued especially in the excellent Commentary of Bousset.

Here too I beg permission to formulate my fundamental conviction regarding the Apocalypse of John in a thesis. By form and content the Apocalypse is separated into two parts: the letters, and the Apocalypse proper, from Chapter iv. on. The letters are

Christian in character; but the Apocalypse proper contains but small portions that are of specifically Christian spirit. In its essential character it is purely Jewish.

This proposition must not be confused with the thesis of the literary critic Vischer: that the Apocalypse of John is a Jewish writing which has been worked over by some editor in a Christian spirit. At present we are simply maintaining that the material of the book, as we now have it, is of essentially Jewish stamp, without undertaking to make any declaration regarding the literary problem involved.

And so for our thesis proper: The subject-matter of the Apocalypse of John in important respects is not of Jewish, but of pagan, origin. It is true, and this is to be expressly emphasised, it has passed through a Jewish intellect, but in the last resort it is to be understood only on the supposition of its foreign origin! It is not our intention, then, to exclude the assumption of Jewish influence in the Apocalypse, but rather to maintain it: and we do not intend to assume foreign origin for all the subject-matter, but only for certain very important portions of it. In so doing we do not by any means deny that other portions of the Apocalypse consist of imitations and expansions of prophetic writings, nor that certain certain features, but yet comparatively little, may be interpreted in the light of contemporary history. Of this entire group of propositions we propose in what follows to offer evidence for the one only: that certain portions of the Apocalypse are of foreign origin.

Such portions are particularly to be noted first of all in the description of the divine enthronisation, Chapter iv. At the beginning we find the 7 torches that burn before the throne of God, which are—so we are told—the 7 spirits of God. These spirits are clearly the same as the 7 angels who stand before the face of God, viii. 2, who according to Tobit, xii. 15, alone have entrance to the glory of the Most High, the 7 archangels. In what high esteem these beings were held by Jewish-Christian tradition is shown by the fact that they are named, i. 4, even before Christ. How old this conception of these seven is, may be seen from Ezekiel ix., where they first appear. These spirits are represented under many sym-

bols: Chapter iv. they are the seven lamps of fire; i. 12 they are seven candlesticks, in the midst of which Christ appears; i. 16 he has seven stars in his hand; v. 6 the lamb has seven eyes. Related to this evidently is the seven-branched candlestick which is described in Exodus xxv. and the somewhat differently shaped one which Zechariah sees in his vision, iv.: Zechariah interprets the lamps of this candlestick as being the eyes of Yahveh, which run through the whole earth.

The question is, how the entire body of these related conceptions, and particularly those in the Apocalypse of John, are to be regarded. How does it come that Judaism and the Apocalypse as well believe in 7 supreme divine beings, which can be represented now as torches, now as candlesticks, now as eyes of God or of Christ, now as stars. The angelology of the Jews—this is the general principle which we follow in arriving at a conclusion—is a sort of reduced or dethroned polytheism. The angels of tribes, of rivers, of countries, of snow and hail, of the sea and the air, of death, etc., were formerly gods who ruled over tribes, countries, rivers, etc. At this point, we may expect, investigators will be most inclined to accept the theory of foreign influence. Accordingly we conjecture that the 7 angels of the Jews are paralleled by 7 gods of the heathen. Inasmuch as the seven angels are the highest among the angels, there must have been in pagandom seven supreme deities. The representation of these seven as candlesticks, torches, eyes and stars goes back evidently to one and the same conception: stars are thought of as the eyes of the divinity, and are represented in the rites of worship as torches or candlesticks. Hence these seven must have been originally stellar deities. And so we conclude that there must have been seven supreme divinities in the Orient, ruling over the stars. Now this inference is most perfectly confirmed by things that we positively know. In the cosmopolitan civilisation of the Babylonians, which had prevailed from time immemorial in the Orient, the seven supreme deities are the seven gods of the planets. As we know, the whole Orient was filled with this belief at that period: we meet it again among the Persians, the Orpheans, the Mandæans, the Gnostics, the Sabians; so this

belief accompanied Babylonian civilisation throughout the world, and influenced Israel and Judaism at various times. And thence comes the belief in the seven spirits in the Apocalypse and in the seven archangels in the Christian Church.

We take up next the 24 elders. They are seated round about the throne of God, themselves on thrones and dressed in garments of royal white, and have golden crowns upon their heads; their number is 24. It was formerly the custom to interpret these figures as being the 12 apostles together with the patriarchs, or as the nations of the 12 tribes doubled by the addition of the Gentile Christians, or as the representatives of the 24 priestly classes: all of which was extremely arbitrary; for judging from the connection, we are dealing here not with human beings, but with angels, and with angels of the highest degree. According to the description and according to their names, these 24 represent the heavenly council of state: they are kings of the world, enthroned and crowned; God is the King of Kings, whose very councillors are kings.

Now whence does this notion come into Judaism? We shall again resort to the conjecture that we have to do with what were originally gods in council. And in fact we find this conception reported among the Babylonians, who have certain twenty-four stellar deities whom they call arbiters of the universe.

A more complicated affair is the interpretation of the four marvellous creatures of this same chapter. It is self-evident that the writer of the Apocalypse used Ezekiel's famous vision of cherubim in the description of these creatures, and also introduced some features from Isaiah's vision of seraphs. But on the other hand, the Apocalyptic writer differs in certain definite points from Ezekiel: Ezekiel depicts the four beings in a remarkable combination with four wheels; the seat of God is at the same time a throne supported by four creatures, and a chariot running on four wheels. But of this entire remarkably incoherent combination the Apocalyptic writer selected only that which had an organic connection, to wit, the creatures that support the throne. In Ezekiel these four creatures have four heads each, those of man, ox, lion and eagle, while in the Apocalypse they have but one each. Here it is evi-

dent that the Apocalyptic writer has the simpler, and therefore the earlier, conception. These creatures also are a sort of "angel," and accordingly we suspect them to be originally gods. There is an especially primitive sound to that feature which attributes to these divinities animal forms; that leads us back to the earliest Oriental times, when the gods were generally represented in animal form. Now what are these four creatures? It is their function to support the divine throne: this is said expressly in Ezekiel, while in the Apocalypse it stands in the background. Now the throne is a symbol of the sky; Ezekiel says this distinctly when he represents God as sitting on the "firmament." Accordingly there are four beings that stand at the four corners of the world and support it with their wings outspread. Moreover, what Ezekiel says of the peculiar movements of these creatures, namely that each can move forward only and that the chariot itself can only advance in the four directions, corresponds perfectly with the motions of the sky: according to the conceptions of antiquity the sky moved by day from East to West, and returned at night under the earth from West to East, while beside this there were the annual motions from North to South and from South to North. Beyond question they were originally constellations, and naturally the four constellations representing the four quarters of the sky, and thence the names: lion, eagle, bull and man. In fact three of these constellations are to be found in the corresponding quarters of the heavens: Leo, Aquila, and Taurus, so that we may cherish the hope that the constellation Homo will yet be discovered in inscriptions.

Another borrowed subject is the representation of the heavenly Jerusalem which descends upon the earth. Here too the assumption would not suffice that the author had chosen passages from the prophets and simply developed them further. On the contrary, the conception of the heavenly Jerusalem is in its nature mythological. For to the question how the belief ever came into existence that there is another and better Jerusalem in the skies, there is only one answer: because the pagans had already declared that there is a divine city in the skies. This notion of the celestial city, then, is only a mythological representation of the sky itself. The

whole process, therefore, was as follows: originally it was the custom to represent the firmament itself as a city of the gods, and then they came to speak of a mysterious city of the gods in the skies. Judaism, which borrowed this belief, called the divine city "Jerusalem."

That this interpretation, which one would think to be self-evident, is the correct one is demonstrated by a number of attributes which are ascribed to the celestial Jerusalem: the city glows with light and glory, with pearls and diamonds. Now light and glory are characteristics of Heaven, and the planets are compared in the Orient with precious stones. The city has twelve gates, and upon the gates twelve angels: the Orient and Judaism as well have much to say of the twelve gates of the sky, over each of which a divinity presides, or among the Jews an angel. The city is of equal length and breadth and height: a peculiar proposition regarding a city, but perfectly intelligible in connection with the sky. Still further, we hear of the wonderful highway of the city,—or a variant of this is the stream which flows through the city: now it is characteristic for the sky that there is a stream in the midst of it, a highway: the Milky Way. Among the Mandæans also and in Greco-Roman tradition we are told of such a wonderful stream that proceeds from the throne of God. That this is the Milky Way has been maintained by Brandt in the case of the Mandæans. The Slavic version of Enoch (the Apocryphal book of this name) describes the Milky Way quite plainly as the celestial stream which is formed from two sources and then divides again into four branches. Even the prophets speak of this stream, which gushes forth from the throne of God. And the notion of the transfiguration of Jerusalem and of the wonderful stream in the midst of the city can be found in the prophets. It is only that the notion appears here in all clearness,—one more foreign element that at various times found its way into Judaism.

The conception of a Jerusalem above is at the same time a clear illustration of the way in which the declaration came to be made that certain persons or things had had a pre-existence in Heaven. Contrary to the usual assumption, this declaration did

not originate from a process of regarding the ultimate goal as the first cause, by means of a remarkable "rhetorical manipulation" (to use Holtzmann's expression[1]), and thus declaring that the valuable was pre-existent, but simply through a transformation under Jewish influence of certain mythological dignitaries, who from their very nature had a pre-existence.

In passing let me refer to the marvellous grasshoppers and the terrible hosts of horsemen which appear at the sound of the fifth and sixth trumpets. It is plain that the famous passage in Joel served as a model for the description of the grasshoppers; but equally plain that the whole of it cannot be explained by reference to this source. The Apocalypse contains a whole series of elements which cannot be interpreted by comparing Joel. Consequently it must have used some independent tradition. Now what can this tradition have been? What sort of grasshoppers are they which come forth from the smoke of wide-open Hell, which have tails like scorpions wherewith they sting men? What sort of horses are these which spit fire out of their lion's mouths? One needs only to raise this question in order to receive from all sides the answer: they are mythological creatures, animal composites such as the religious imagination of the Orient was fond of painting.

Finally, let me refer to the arrangement of the plagues in the Apocalypse of John. These plagues are regularly divided into seven periods; occasionally, as in the case of the four Apocalyptic horsemen, we can discern that the material was originally divided into four periods. Accordingly there is at the bottom of this arrangement the conviction that the end of the world would be divided into four or seven periods, or, as other Apocalyptic writers say, into twelve periods. This tradition corresponds to the other one, that the whole age of the world is to be divided into that number of periods. This latter tradition, originally to be interpreted from astronomical observations, is found not only in Judaism but everywhere in the Orient, and comes in the first place from Babylon. And so too in these visions of plagues, we meet in part primitive

[1] *Theologie*, I., p. 406.

oriental material, a fact that is not without significance for the interpretation of individual details.

THE APOCALYPTIC DRAGON.

But the capital illustration of this whole attempt at the interpretation of the Apocalypse by reference to mythical elements from the Orient is the traditions of dragons, especially those of the birth of the Messiah, Chapter xii. Here is really the point where we may have our eyes opened. The proposition that mythical elements are to be found in Chapter xii. has already been published more than once. On account of the resemblance of the passage to the Greek myth of the birth of Apollo, Dieterich conjectured Greek origin for it. Next the present author undertook to prove that the passage is in its very nature mythological, and tried to interpret it as a Babylonian myth. Bousset agrees with me in the principle contention: that there are mythical elements involved, but differs with me on many other questions, as to whether the passage came to the last Christian Apocalyptic writer through a Jewish tradition, or whether he selected it of his own notion, whether this independence of the last hands that manipulated the material should be regarded as greater or less, etc. It is the especial merit of Bousset to have suggested the comparison with an Egyptian myth.

But we shall not consider here the various points in which Bousset and the writer differ, but only the one fundamental point, that this chapter is based upon mythical tradition. For this is after all the essential matter for the present in our scientific treatment of the chapter. Whether the material is originally Babylonian or Egyptian is a secondary consideration: later generations may tax their brains over that. The task that our generation has to perform is to prove that it is in its very nature a god-myth. And it does not seem to be superfluous to discuss this point a second time, for only a short time ago no less a scholar than Wellhausen published an interpretation of the chapter "on the basis of contemporaneous history" in the customary fashion, entirely ignoring the mythical origin of the chapter.

A "dragon" is a creature of the religious imagination: it is in

its very nature a mythical being, a pagan divinity. Narratives that deal with dragons are by their very nature pagan myths. Accordingly when we meet with dragons in ancient Israel, in Judaism or even in the Apocalypse of John, when stories are told of them, or such stories are assumed as familiar, the first suggestion of explanation is that we are dealing with pagan dragon myths. This does not mean that every individual feature that is connected with a dragon in the Apocalypse of John is of this nature, but that we are justified in examining it with a view to such explanation.

Now for the details of Chapter xii. A woman appears in the sky, her garment the sun, beneath her feet the moon, a wreath of twelve stars upon her head. And we ask: What is such a woman in her very nature? How did men ever come to talk of such a celestial personage? In Judaism such a personage is seldom met with: for the celestial personages of Judaism, the angels, are almost without exception men. But paganism is familiar with feminine personages also. And the adornments, too, which that woman wears are clearly characteristic of a celestial goddess: similar Oriental representations are familiar to us. Furthermore we are told that the woman is with child, and cries out in the pains of travail. A celestial woman personage, with child, and crying out in the pains of travail is entirely foreign to the character of the Jewish-Christian angelology: in heaven there is neither begetting nor bringing forth. This feature also has a decidedly mythological sound. But most remarkable of all is the touch, that the woman succumbs to the travail pains and cries out. It is a strange notion that such glorious beings, who rule over sun and moon, should have pains, actual bodily pains,—a notion which can be understood only in a mythological sense. And an unprejudiced person, to whom one should read this beginning of the story for the first time, with the question, What sort of a story is this? would surely reply: It is a myth!

Before the woman stands a mighty, fiery red dragon with many heads and horns; from the following context we judge that he is the former king of the world, and his home in the pit. Raging he dashes one third of the stars down from the firmament with the

blow of his tail, so immense is the length and size of it. He stands before the woman ready to devour the child as soon as it shall be born. But why does he wish to devour it? We may conjecture from the context that the dragon is the king of the ancient world, and a new king is about to be born; but the old king wishes to maintain his dominion and to get rid of the new one in the simplest manner: he proposes to devour him immediately upon his birth!

What grotesque tale is this? It is a primitive Oriental tale of the gods very similar in tone to the Babylonian and Egyptian myths.

Then come the following two scenes, which are especially distinct: the beginning of a combat among the gods: the dragon attempts to storm the heavens, whereupon a heavenly army comes forth to meet him and overcome him. This is a scene with much resemblance to the combat of the Titans. Parallels are to be found among the Mandæans and the Manichæans. There are especially numerous concrete features in the scene of the flight of the woman: the woman flies away over the earth on the wings of the great eagle, the dragon pursuing; he spews forth a stream after the woman in order to sweep her away; but the earth comes to the woman's assistance and swallows up the stream.

It is particularly easy to recognise the mythical foundation in this; at the birth of the world-king the elements are in commotion; earth and water contend with each other for the solar queen. Parallels to this description of the flight of the woman are to be found in the myths of Apollo and of the birth of Horus. How strained and unsatisfactory Wellhausen's interpretation, that the flight of the woman is here simply the flight of a remnant from the catastrophe brought upon Jerusalem by the Romans; the water and the disposal of it, he says, have no further significance! But if the Apocalyptic writer had wished to say no more than that, could he not have spoken somewhat more distinctly? What was the use of all this imaginative bombast? One would think that every one who has up to the present bothered himself with the attempt to interpret this material by reference to contemporary history would heave a sigh of relief when he heard an explanation

which can really explain the strange character of these elements. And the explanation is: This story is a myth. And specifically, it is as Bousset also recognises, originally the sun-god, born of a celestial goddess, who is pursued by the dragon of hostile floods.

In other features of the dragon traditions also the mythical element appears. The two lamb's horns which are worn by the second beast in Chapter xiii., cannot be explained offhand as symbols of his seductive powers, but must go back to some old mythical tradition. And further, the feature that the dragon and his followers summon the kings of the earth (Chapter xvi.) by frogs; and finally the closing scene, in which the heavens open and a host of celestial horsemen dash forth, the new king mounted on a white horse at their head, bearing on his garments and on his thigh the name by virtue of which he holds dominion over the earth. The dragon is then defeated in combat; once more the scene of a battle of the gods, a mythical battle.

Finally there is some mythical foundation for the story of the two witnesses in Chapter xi. These two personages have been interpreted by Judaism as Moses and Elias, from whom some of the features may indeed be explained; but other features are of an entirely different kind. The beast that rises from the abyss makes war upon them and will overcome them; their bodies lie in the streets of the great city. But after three and a half days the spirit of life will enter into them again and they will rise to heaven in a cloud while their enemies look on. Bousset has cited for comparison here a related tradition of Elias and Enoch who unmask the anti-Christ when he appears in Jerusalem, and in turn are slain by him. Bousset regarded the tradition which appeared in this form in the second century after Christ as the oldest, and proposed to explain the Apocalyptic version from it. But to me this tradition seems to be a later, less mythological, and Judaised form of the legend. In the Apocalyptic passage what seems to me especially mythological is "the beast that rises from the abyss," which is evidently at the last the same creature as the dragon of Chapter xii., who rules over the waters, and as the first beast of Chapter xiii, which rises up from the sea. Jewish tradition has declared the

two personages who appear as his opponents to be witnesses of God, that is, prophets. But behind this are glimpses of an older interpretation, according to which the "beast" "makes war" upon them. They are, therefore, originally divine warriors, celestial soldiers, who make war upon the beast with weapons, just as afterwards Christ, the young, celestial hero, charges upon the beast mounted on his white horse. Here, too, then, there are mythological features, unmistakable though greatly faded, and accordingly when we read that they are resurrected after three and one-half days and ascend to Heaven on the clouds, we should not be too quick to assume that this is an imitation of the resurrection of Jesus Christ. According to the declarations of the New Testament Jesus Christ ascended into heaven after three days, or on the third day, while in the case of these "witnesses" it was three and a half days. It should not be overlooked that resurrection and ascension are in their nature mythological traits which fit splendidly into this originally mythical context; so we must at least reckon with the possibility that we have here a primitive mythical legend preserved.

Finally we come to the scene in chapter v. At the right hand of God lies a book sealed with seven seals. Judging from the context, the contents of the book consist of the final things, the end of the world. When the seals of the book are loosed, then will come to pass the things that are written in the book. If the book is not opened, the end of the world will not come. A celestial herald summons all the creatures of the whole world to open the seals of the book. In order to open such a book—so at least we must imagine—one must have marvellous, divinely mysterious power, must be initiated into the deepest mysteries, consecrated with the wonderful powers of the supernatural world. But this book is so wonderful, its seals—so we may fancy—are set with such mysterious and awful characters that none of all these powers, great and fearful as they may otherwise be found, are equal to the task of loosing them. This book defies all the magic in Heaven and under the earth! Hitherto there has been a failure to perceive the nature of these notions. This book with the seven seals, by virtue of which the end is to come, and which no one has the power to

open, is a book of necromancy. Magic of all sorts plays an immense rôle in the syncretic religions of the age we are considering. As a parallel we may mention the recently published Egyptian narrative of the book of magic written by the god Thoth, which is contained in a sixfold chest and guarded by a gigantic serpent on an island covered with serpents. Here, then, in the fifth chapter of the Apocalypse of John we have documentary proof that similar notions of magic entered Judaism and Christianity also.

The following scene describes how the opening of the book comes to pass: Into the group of divine beings enters a new figure. Whence it comes, we are not told; that remains a divine secret. This being receives the book from the hand of God and has the power to open it. Thereupon all creatures bow before him, for unto him worship is due. He has power greater than that of all others; he is the magician superior to all other magicians; at his command the end of the world will come. What is here described is the enthronement of a new god, the lord of the book, the lord of the end of all.

In the Apocalypse of John as we have it this scene is applied to Jesus; but at bottom it is altogether out of harmony with his character: this figure of the great god of magic who opens the book, this figure with seven horns and seven eyes, is utterly alien to the historical Jesus, and can have been identified with him only long afterwards. In the whole vision there is very little that is specifically Christian, and somewhat more that is Jewish. Most notable of all the Jewish elements is the fact that the monotheistic point of view is maintained. There must have been a certain school of Jews who spoke of a great being who was to come and who, by virtue of his magic power, would be recognised in the divine council as supreme, and would finally bring in the end of the world. And indeed we have in Ezra a passage which expressly assails the belief that the last judgment would come about through another being than God.[1] But in the last analysis this belief in the appearance of a new personage cannot be explained adequately on Jewish

[1] IV. Ezra vi. 1 ff.

foundations alone; we must assume that this belief pervaded alien religions which influenced Judaism: a religion which represents as a great magician the god in whom it places its hope, must have indulged in much sorcery while it prevailed.

Up to this point we have found in the Apocalypse of John an abundance of legends which, according to our conclusions, must have existed at some time in Judaism; but only a small portion of these legends is expressly authenticated in the Jewish, and especially in the Apocalyptic, writings preserved to us. It is very important to recognise this fact; only a small portion of the entire and manifold life of Judaism in the time of Christ is known to us. As we now know, there must have been in the neighborhood of a hundred Apocalyptic books; and many legends, perhaps for the very reason that they were secret legends, were never committed to writing. What would be known of the Essenes, for instance, if we had not the few references in Josephus and Philo! It is exceedingly important to see this point, for modern investigators are too much inclined to assume altogether too quickly that thoughts and conceptions which are not authenticated in the Jewish writings at present preserved to us could not have existed at all. On the other hand, it is to be said that, after the rise and excision of primitive Christianity and after the great Roman devastations, Judaism grew intensely onesided. And particularly did it discourage those tendencies from which primitive Christianity had developed. Thus it comes that the particular school of Judaism which we meet in the New Testament, and in the New Testament speculations, drops out of sight. We are obliged to reconstruct it anew from the New Testament itself.

Furthermore, what we have hitherto noted of the Christology of the Apocalypse of John is of great significance. The Christian circles which took up the Apocalypse identified the magician-god of chapter v., the boy who is saved from the dragon, the young hero who overcomes the dragon, with their master, Jesus. How this was possible is very obvious: Jesus was the Christ,—that was their fundamental conviction. And so they transferred to Jesus all that they already believed regarding the Christ. And thus traits

that are utterly alien and most grotesque became attributes of Jesus. This observation seems to be of particular importance. For something quite similar came to pass in the speculative theology of the New Testament. In the entire Christology of the New Testament the historical person of Jesus and his impression is but one factor, while the chief features of that Christology come, not from the historical Jesus, but arose independently of him. On this point we shall have more to say at the end.

MYTHS IN THE GOSPELS.

We come now to the narratives of the Gospels. The Gospel narratives of Jesus, which are derived from the oral tradition of the oldest congregation, contain on the whole extraordinarily good historical substance, but along with this also many legendary expansions, adornments, and touches that have been carried over from the Old Testament. And besides this historical and in part legendary material there is still another stratum of narratives which are in part of a different origin. These narratives gather before and after the historical traditions proper, before the appearance of Jesus and after his death. Among these narratives we may expect to find such as are properly legends of gods and heroes, and which were attached to Jesus at a later time.

The most characteristic and obvious example of these originally mythical tales is found in the Stories of Jesus's Childhood. The fundamental motive of both the narratives of the childhood of Jesus is that Jesus was born, without the participation of any man, of a virgin, through the mysterious influence of a divine spirit. This *motif* is in its very nature mythical; it is essentially the same that is told of their heroes by the people round about. As is well known, Celsius was reminded by it of Danae, of Melanippe, of Auge and Antiope; but even Justin says: "We are introducing nothing new in comparison with your sons of Zeus; for you know how many sons of Zeus are cited by your highly esteemed writers."

But the primitive Christian stories of the infancy of Jesus differ above all from these pagan myths by their greater delicacy and reserve: in the place of the god who goes into the maid we have

the holy spirit, who overshadows the virgin. What actually takes place remains in mystery, only remotely hinted at by delicate words. It is particularly noteworthy also that in this connection the word "spirit of God" is employed: for as is well known the word is in Hebrew feminine, and is comparatively inconcrete;—a masculine word in this connection would have been too coarse.

Now it has long been recognised that this conception is wholly alien to the notion of divinity peculiar to pure and proper Judaism. The Judaism that is derived from the Old Testament, it has correctly been said, might speak of the miraculous creation of a child, but not of its miraculous begetting through a divine agent. Justly enough we are reminded of the shudder with which the mingling of the sons of God with the daughters of men is mentioned in the sixth chapter of Genesis. From these circumstances the modern conclusion is that the narrative of the miraculous birth cannot have originated on Jewish-Christian soil, but upon pagan-Christian soil. On the other hand, the narrative in Luke is plainly a translation from the Hebrew. Accordingly it is inferred that the verses in Luke which speak plainly of the miraculous birth are a pagan-Christian interpolation into a Jewish-Christian source. But without warrant. The account in Luke of the annunciation is consistent with itself. The very verses which it is proposed to reject on account of their lack of harmony and to declare pagan-Christian, i. 34 ff., make perfectly good connection when translated back into Hebrew.[1]

Furthermore, the narrative in Matthew, at least in its essence, is Jewish-Christian: it contains a Jewish pun (i. 21). And so we see that here a characteristically pagan conception present in Jewish-Christianity is transferred to Jesus. This is a point of great and fundamental importance. The conceptions that tended to paganism and mythology were not limited to later pagan-Christian-

[1] The angel announces to Mary (*καὶ ἰδοὺ συλλήμψῃ* = הִנָּךְ הֹלָה = "thou art on the point of conceiving") her immediate impending pregnancy, and she replies: "How is that possible, since I have known no man?" (*οὐ γινώσκω* = לֹא יָדַעְתִּי = "I have until now known no man"). This removes the real objection to the unity of the story. The whole story, as its style and content clearly show, is Jewish-Christian.

ity, but they were already in existence in Jewish-Christianity. But this would have been impossible if Judaism had not already possessed these conceptions. We must assume that the birth of the Christ from a virgin and through the divine spirit belonged to the christological dogma even before the time of Jesus, just as did his origin in Bethlehem and from the family of David, and was attached to Jesus afterwards. What we have to learn, then, and what is to be shown over and over in the following pages, is that the Judaism which developed into Primitive Christianity must have been already strongly tinged with syncretism.

This transference of alien features to Jesus is to be recognised with especial clearness in the account of Matthew. For his account of the pursuit of Jesus by Herod and the latter's miraculous rescue we have an abundance of parallel versions. The same story is told everywhere in the Orient and the Occident, in ancient and modern and in the most recent times, about gods and heroes: of Zeus, Apollo, Horus, Cyrus, Romulus and Remus, etc.; and fundamentally it is the same story as that of the birth of the child in the Apocalypse of John, chapter 12. It is always the old king who pursues the new ruler that is to be born according to an oracle; while contrary to expectation the child is saved by a miracle and the oracle is finally fulfilled. Hundreds of generations have taken pleasure in this story. They have told this story about their most revered divinities and their most brilliant kings, and the Jews told it about their Christ. Jesus made such a mighty impression upon his generation, that the primitive legend was transferred to him: he must be born of God Himself, even as the prophecy regarding the Christ said.

In passing we may mention a few lesser traces of the mythical element in the Gospels. In the account of the baptism of Jesus the appearance of the Holy Ghost in the form of a dove arouses interest and hesitation. Thus far this feature has stood without explanation. Here, too, some mythical element may have entered into the story. There are Oriental images of the gods with a dove upon the head of the figures.

The story of the temptation, also, is very extraordinary. The

appearance and action of the Devil in it is of mythical character; likewise the high mountain from which are to be seen all the kingdoms of the earth and their glory. It is possible that the subject was originally a struggle between gods for dominion over the world. But here the struggle is carried on, not with weapons, but with sacred words: each of the combatants contends with passages from the Scripture.

Through the story of the transfiguration also we catch glimpses of mythical elements; there appear three transfigured celestial beings. And the phrase: "Let us build tabernacles here," which yields no sense in the present connection, must sometime have had some sort of sense.

Again in the miraculous increase of the loaves in the feeding of the multitude we are inclined to suspect a mythical character, in the miraculous transformation of the water into wine at the wedding in Cana, in the walking upon the sea, etc. At any rate, we should be more ready, in dealing with the stories of the Gospels, to face the possibility that there are mythical features involved.

MYTHS REGARDING THE RESURRECTED JESUS.

The mythical element enters more largely into the accounts of the appearances of the resurrected Jesus. The story of the disciples at Emmaus is strikingly antique in style: Christ appears as a traveller unrecognised and reveals his mysterious and divine nature only through certain characteristics; but as soon as he is recognised, he disappears. This sketch of the story is perfectly analogous to the oldest narratives of the appearance of a divinity: the story might be taken from Genesis so far as its style goes.

It is perfectly obvious, and probably generally recognised, that the idea of the resurrection is mythical; it is thus that pagans speak of the apotheosis of the hero, or they tell how the young god, after having defeated his enemies and won dominion over the whole world, is acknowledged as supreme God in the hosts of Heaven! Even in the Psalms there are such descriptions of Yahveh, as he ascends into the heavenly heights accompanied by

shouts of jubilee and takes possession of the supreme throne of the world.

We have already observed such a scene of the enthronement of a supreme god in chapter v. of the Apocalypse of John. Similar notions are met here and there not infrequently in the New Testament Epistles: God has placed Jesus at his right hand in the celestial world, high above all dominion and might and power (Ephesians i. 21); he appeared to the angels and is received in glory (1 Timothy iii. 16); he has received a name that is above all names, so that at his name all knees shall bow, of those that are in Heaven, on the earth, and under the earth (Phil. ii. 9 ff.); he has gone, moreover, to the right hand of God in the Heavens, where angels and principalities and powers were made subject to him (1 Peter iii. 22).

It is clear that the idea of such enthronement is in its nature mythical. In the last analysis there is at the bottom of it the myth of the sun-god, who, rising from the depths, forces his way to Heaven and founds there his new and celestial kingdom. In Judaism too we read once of such an ascension of the Christ out of the depths of the sea (4 Ezra xiii.).

The idea of the descent into Hell, also, is mythical; it is hinted at in several places in the New Testament (Eph. iv. 8–10; Matt. xxvii. 52 ff.; 1 Peter iii. 20). The Apocalypse of John i. 18 is also illumined by the light from this notion: Christ appearing comforts the Seer saying, "I was dead and am alive, and have the keys of death and of Hades." We can make these words much clearer on the basis of especial Mandæan conceptions. The realms of death and of Hades, underneath the earth, are comparable to cities, the gates of which are locked with keys. The divine Saviour descends into Hell; he succeeds in getting possession of the keys and thereby obtaining control over it. He can now close up the subterranean realms at his pleasure. By means of such images the Apocalyptic writer makes it clear to himself that Jesus through his death and resurrection has won the control over death.

THE ORIGIN OF SUNDAY.

We come now to another problem, which in its turn can be solved only by recourse to the practices of a foreign religion: the origin of Sunday as a festival of the Christian Church. The custom of celebrating Sunday, the first day of the week, or, as it is also called, the eighth day of the week, as the day of the Lord by assemblies, is a feature of the earliest stage of the Christian Church. We have positive though slender evidence of this even from the earliest times (Acts xx. 7; Apocalypse i. 10). It even seems to have been a custom in Corinth, according to Paul (1 Cor. xvi. 2). It is very difficult to explain the origin of this custom on the basis of primitive Christian conceptions. The establishment of a new festival day is far removed from the lofty and free spirit of the Gospel. It has been said that the Church celebrated in this way the day of the resurrection; it is certainly true that the celebration of this day was justified on this ground in very early times (Epistle of Barnabas xv.,—one of the Apocryphal books of the New Testament), and the declaration that Jesus rose from the dead on Sunday is found even in our Gospels. But how did it happen that they began to celebrate the day of the resurrection every week? How are we to explain the fact that they called this day "the day of the Lord" (ἡ κυριακὴ ἡμέρα)? What has Jesus of Nazareth to do with a set festival? And why did they place the resurrection as having occurred on Sunday? For surely no one witnessed the resurrection!

All these difficulties are cleared up as soon as we go at the subject from the standpoint of the history of religion. If we were to hear of such a celebration of Sunday in any other Oriental religion, and then asked the question, "Who is meant by this Lord?" after whom Sunday is called "the day of the Lord," we should forthwith receive the answer: this Lord is a God. The notion that certain days belong to certain gods was at that time widespread in the Orient; and Sunday, as the name still indicates, had been the day of the sun-god from primitive times in the Orient.

When the primitive Christian Church celebrated Sunday, it was adopting indirectly the celebration of the festival of an ancient divinity. The historical picture that we are warranted in giving is something like this: There must have been in Judaism certain circles who were accustomed to celebrate Sunday; and the oldest Christian congregation must have been recruited from these circles. But the Christian Church must have identified the "Lord" in whose honor the day was celebrated with their Jesus. A trace of this observance of Sunday even in Judaism is found in the Slavic Book of Enoch (xxxiii. 1), in which the eighth day is praised as superior to the Sabbath: "The seventh day," so the passage reads, "I blessed because it is the Sabbath on which I rested from all my works, but I established the eighth day in order that the eighth day should be the one first created over all my works." As foundation for the esteem in which the eighth day was held, a system of chronology is cited according to which the days of the week correspond to the entire age of the world, and the eighth day to eternity, the day of Judgment.

It is furthermore expressly recorded, Romans xiv., that the observance of other days made its way into the oldest Christian Church, or threatened to do so. And likewise we know that the celebration of Christmas, for instance, made its way into the Christian Church in a later period from syncretic circles. In the case of the Essenes we have an older example of the influence of pagan observance of periods of the day, especially of the phases of the sun. The adoption of Sunday by the primitive Christians is, as it seems to me, an exceedingly important symptom of the fact that the first Church was incidentally influenced by a spirit which was derived neither from the Gospels nor from the Old Testament, but from syncretism.

RESURRECTION ON THE THIRD DAY.

The fixing of the date of the resurrection is connected with the observance of Sunday. We are told that Jesus rose from the dead on Easter Sunday early in the morning at sunrise. But it would seem as though even one who is not accustomed to bother himself

with the history of religion would hesitate at this, and be disposed to ask: Was it chance that the claim is made that Jesus rose from the dead on this particular day of the calendar, on this especially holy Sunday, with which the sun arises from the night of winter? Are we not warranted in assuming that the idea of the resurrection of the dead god had long before fixed upon this day?

We go still further in this direction when we observe that the number "after three days," or, as a variant, "on the third day," recurs constantly in the accounts of the New Testament. The importance which the budding Christian Church attached to this number is shown by its constant recurrence. Even Paul in the famous fifteenth chapter of 1 Corinthians says that Christ "rose again the third day according to the Scriptures" (1 Corinthians xv. 4), and the number recurs in the Apostle's Creed. How did it happen that such importance was attributed to this number? The age of the New Testament gives us the key to the answer: because it had been prophesied (1 Corinthians xv. 4; Luke xxiv. 48). But it is well known that this prophecy is not found in the Old Testament, but that it was read into the text afterwards. No such prophecy of Jesus's resurrection after three days was found in Scripture until the number of three days had been set for Jesus's resurrection by another source. But whence did the authority for this number come and why was such stress laid upon it?

And now consider the fact that the number appears in two variant forms: "after three days," and "on the third day." The form "on the third day" fits the chronology of the Gospel account, according to which Jesus dies on the day before the Sabbath and rose from the grave on the day after the Sabbath. But whence comes the form "after three days," which really cannot be harmonised with the other reckoning? There is scarcely any other answer possible than this: The resurrection after three days is a doctrine which was adopted by the first Christian Church and can be explained only as the influence of some alien religion. Now the number "three days" is well known to us from other legends. Jonah remains three days in the whale's belly: this feature of the account of Jonah, for which we have many other parallels, goes

back originally to a myth of the sun-god who was swallowed up by the monster of the sea for "three times long." In Daniel "three and a half times" is the period for which Evil shall have power on earth; this number occurs again in Daniel vii. in what is originally a mythological connection: the course of world-year is being described,—the entire time of the world embraces four world-periods, which are in Daniel the four kingdoms of the world, represented by the four great mythological beasts, each of which dominates one of the periods; the fourth of the terrible beasts rules in the last world season, the winter of the world, for three and a half times, which is therefore the length of the world winter. In the Apocalypse of John, chapter xii., the young celestial hero, the sun-god, requires after his birth three and a half times to grow until his victory over the dragon, and during this period the saints on earth are persecuted. In the Mandæan literature the divine hero Hibilziwa is called the child of three months and a day; Apollo storms Parnassus on the fourth day after his birth; after three and a half days the two witnesses in Revelation xi., whom the dragon has slain, rise from the grave and ascend to Heaven. In all these cases we are dealing with modified legends: three, or more exactly, three and a half, is the period during which Evil has power, the period of sin and death, in which the God is growing and in concealment, while it seems to be consumed by Evil, until finally it rises from death and overcomes Evil. In many of these cases it is obvious that the number is derived from the life of the sun-god; it is the time during which winter prevails.

From this foundation, then, we have an explanation of the strange number of three days for the resurrection of Jesus; and this explanation is: Before the time of Jesus there existed already in syncretic Jewish circles a belief in the death and resurrection of the Christ. In the religions of the Orient it is nothing remarkable for the gods to die and be resurrected; we have such a belief authenticated in Egypt, Babylonia, Syria, Phœnicia. In Crete they even showed the grave of Zeus,—of course his empty grave. And that such a belief should be transferred to the Christ among the Jews is not by any means so improbable as would appear at

the first glance: 4 Ezra (vii. 29) speaks, although but cursorily, of the death of the Christ. And even in the Old Testament there is a mysterious chapter, which has hitherto defied all attempts at interpretation, which speaks of a personage who is greater than Moses or Joshua, who is called to lead the people back and to group them anew, even to stretch the heavens anew and prepare a new foundation for the earth: this personage has already appeared but remained unrecognised; he died a shameful death, but will be resurrected unto the glory which is prepared for him.

And in this chapter also, in the last analysis, there is no other explanation but that we have in the background the figure of a god who dies and is resurrected, which Judaism adapted to its own use after its own fashion. It is indeed no accident that the Church of Jesus referred to this particular prophecy: at bottom the two—prophecy and fulfilment—are identical, and we have a case of that phenomenon which we have so often observed, that the same material, variously adapted, appears in several different forms in history. It is known that this belief in a Christ who should die and be resurrected did not exist in official Judaism at the time of Jesus. But this does not interfere with the assumption that the belief existed in certain private circles, and in corners.

If what we have just suggested is well founded, we have thrown a certain light upon the origin of the belief in the resurrection of Jesus. It would not occur to the writer to try to "account for" the origin of this belief; he does not ignore the truth that other factors are to be considered in connection with this belief. But nevertheless it is significant that certain already existent conceptions coöperated with the disciples of Jesus after the death of their lord.

THE PAULINE DOCTRINE OF BAPTISM.

The presumption that I have here expressed will be regarded as very radical. But perhaps this opinion will be altered by consideration of the apostle Paul's doctrine of baptism. In baptism, such is Paul's teaching, the believer is united with Christ; baptism is a symbol of death and burial; he who is baptised in Christ ex-

periences in baptism the death of Christ; thus he comes forth out of baptism as one who has died and been recalled to new life,—with his new garments he has put on Christ. Thus by the power of the cross that which happened to Christ on the cross is experienced by each individual in baptism.

Such a doctrine must seem incomprehensible to one who comes fresh from the study of the New Testament, and especially so if he knows the teachings of Jesus as presented in the synoptic Gospels. He must regard with boundless surprise the mystical union with Christ, the interpretation of baptism as drowning, the belief that eternal life is to be attained by such a sacrament, and the belief that what once took place with the celestial personage is repeated for the individual in the sacrament, for all of this finds no analogy in the Old Testament. And this interpretation did not arise organically from the practice of baptism itself, but was injected into it afterwards: baptism is inherently a washing, a purification, but not a slaying. Holtzmann says justly[1] that in the entire body of Pauline thought no element is so far removed from the spirit of the Gospel of Jesus which is so firmly planted in the soil of Israel, and so alien to it, as this doctrine of baptism. Comparisons have been suggested with customs in the Greek mysteries, and these are in fact similar.[2] But here too the Orient has been left out of account. In the Orient such ceremonies had existed for thousands of years, especially in Egypt. The mysteries of Osiris call for especial consideration.[3] Osiris too was slain, but came back to life; the victory of his son Horus had given him new life and dominion over the West. Hope and expectation are connected with this god who has made his way through death to life. There are definite formulæ and magic rites by means of which believers hoped to attain to eternal life as did Osiris. "In the mystical union with the divinity they found a reason for hope";[4] as the god passes across the celestial ocean to the beautiful West, so the deceased goes across the beautiful western sea to the realms of rest, and

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[1] Holtzmann, II., p. 179.

[2] Holtzmann, II., p. 178 ff.

[3] Ed. Meyer, I., pp. 98 f., 76, 114.

[4] Tiele, *Gesch. der Religion*, I., p. 44.

here he may hope to live with the ransomed in the retinue of the gods, to behold and share in their glory. Later they said that the deceased would rise again from the dead as sun-god, and after overcoming the dangers of the realm of the dead would come to light again with the victorious god Ra.[1] The fate of the dead, it is expressly declared, is but a reflection of the fate of the god; by virtue of the conjurations the man becomes Osiris himself. These doctrines belong to the oldest Egyptian period and were afterwards transferred to other gods.

These parallels borrowed from the history of religions are indeed striking, notwithstanding the deviations in detail, which we have no intention to conceal. Here too is the belief that one can attain to eternal life through death, by the mystical union with the god who himself has died and been resurrected. Is this coincidence fortuitous? Or shall we not rather assume that the mysteries of the god who had died and yet was alive were at that time widely known in the Orient, and that they reached Paul through the medium of Judaism? Humanity at that period was full of the longing for immortality, full of the attempt to attain symbols that would give assurance of immortal life: through Paul this spirit entered into Christianity, and in the interest of this belief Paul transmuted the originally entirely alien custom.

But the great difference between the old Egyptian doctrine and that of the New Testament is, that in the former the entire concern is to give immortality to man, while in other respects he remains unchanged; his earthly appetites and enjoyments do not cease to exist in eternity, but persist, as in the heaven of Mohammed. In the New Testament, on the other hand, we read of the attaining to a new life, which is indeed a new one in every respect as opposed to this fleshly life. And so there is no need of concern that this religio-historical explanation of its origin will detract from the value of New Testament religion; on the contrary, it will bring that value out into the strongest light. This ought to be demonstrated right here in at least one point.

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[1] Tiele, I., p. 44.

RELATION OF OLD TESTAMENT TO NEW.

All the details which have here been presented are valuable only in proportion as they rest upon a certain fundamental view. And this view I propose to sketch in closing.

The Old Testament scholar who takes up the New Testament through the Synoptic Gospels enters a world there in which he feels entirely at home; there breathes a spirit which he understands well, which he knows to have come from the noblest of the prophets; and with joy he greets here the most glorious transfiguration of all that the prophets and psalmists wished for in their loftiest moments. In the words of Jesus there is relatively little that seems unfamiliar, and this little is only what must at that time have been generally accepted in Judaism; the alien features of the New Testament are centered in the eschatology and especially in the doctrine of the resurrection.

But it is a very different picture that is presented by the rest of the New Testament, especially by Paul and John. Here the Old Testament scholar meets at every step things for which he can find absolutely no analogy in his own field, and which he cannot understand historically. Recall simply such thoughts as the second birth, the son of God in the metaphysical sense, atonement through the death of Christ, mystical union of Christ with the Church, the creation of the world by Christ, and others; and although sometimes the same words occur in the New Testament yet they have here a sense entirely foreign to the Old Testament: בָּשָׂר, for instance, so far as it has an ethical significance, means human nature from the side of its frailties; but with Paul σάρξ means the evil principle in man with a positive anti-divine energy.

No greater error could be committed than to assume that all the speculative notions of the New Testament must be explained on the basis of the Old Testament alone. The differences between the Old and the New Testaments involve first of all the language. Paul manifests a use of language which is very complex and developed into exceptional precision, and which can be comprehended

only in part on the basis of the Old Testament and the Gospels. And this use of language is but the reflection of more important things that are taking place beneath the surface. In the speculative thought of the New Testament we are dealing with great, fundamental religious conceptions and sentiments which are wholly or largely without analogy in the Old Testament. Consider for instance the longing of the human soul to escape from sin and the world, to be delivered from the body of this death, to behold the ideal in the image of one who is more than man, to make sure of God himself, to whom no one has access and whom no eye has seen, in the form of a representative whom one can more confidently approach, to be sure of atonement through the vicarious death of a supernatural being, to enter with one's whole soul into this being, and to experience in the sacrament the powers of the supernal world. Read, in order to realise the gap that lies between, one of the prophets or a few of the Psalms, and then the Epistle to the Romans. How did this new spirit enter into primitive Christianity? Not through Jesus, in whose discourses the notions of salvation, atonement, justification, second birth, and reception of the spirit are not found.[1] In the teachings of Jesus everything centers about an ethical imperative born of supreme religious individualism; in Paul the center of all is the belief in a system of saving facts which occurred at the same time in Heaven and on earth.[2] Nor did all this come new into existence from the experiences of the disciples in connection with the historical figure of Jesus. If this had been the case, we should expect to find these doctrines especially in the circle of the first disciples. But now it is generally recognised that these doctrines did not come in until the second and third generations. And in any case, even the experiences derived from contact with Jesus presuppose somehow a predisposition and a longing for these experiences. One who had been reared in the atmosphere of the Old Testament, and in that alone, would not have had this same experience with Jesus.

Now anyone who considers collectively all these doctrines

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[1] Wernle, p. 78. [2] Wrede, p. 67.

which are foreign to the Gospel cannot fail to marvel at the enormous spiritual activity of primitive Christianity, and will be inclined to assume that there must have been at work here an extraordinarily large outside factor. It is not the Gospel of Jesus, but the primitive Christianity of Paul and John, which may be called a syncretic religion.

Now where are we to look for this outside factor? At present it is the custom to seek it almost exclusively in the influence of neo-Hellenism, particularly in that of Alexandria. Let me again declare that this factor, which it is not my purpose here to discuss, is not to be ignored or underrated. But the question is, whether this entirely explains the problem. The variety of details which have been collected in the preceding pages forces us to ask whether the outside factor is not to be sought in the Orient. And in this field we are perfectly justified in turning first of all to the effect of Oriental Gnosticism. The connection of Paul and John with later Occidental Gnosticism has long been acknowledged. And now recall the sketch of Oriental Gnosticism which has been presented in the preceding pages. In fact, primitive Christianity agrees with this Oriental Gnosticism in many points wherein it differs from the Gospels: we need mention here only the high value placed upon γνώσις (*Erkenntnis*, knowledge), the division of the world which occasionally suggests dualism, the longing of man for salvation, the belief in the descent of a divine saviour, the belief in the sacraments, the treatment of gnosis as a sort of mystery, which plays a large part in the New Testament also (the Gospel of John is keyed throughout to this tone of infinitely deep mysterious doctrines which common men hear not though having ears that hear), etc.

Indeed there are common elements even in the style itself, such as "the life," "the light," the "word of life," the "vine," all as names of æons. All this should be enough to lead the New Testament student to seek for clues, not only in Hellenism, but also in the Orient; it would be an especially valuable service if some one would determine just how much of the linguistic character is actually derived from the Old Testament.

THE CHRISTOLOGY OF PAUL.

Let us now select from this whole body of material two points which may be regarded as the central features of the New Testament. First of these, the belief in the resurrection. With regard to this belief we have already shown in the preceding pages that it goes back through Judaism to the Orient. The second great point is the Christology. The origin of the Pauline and Johannine Christology is the problem of all problems in the New Testament. Modern exegetics, if the writer is rightly informed, agree in the opinion that this Christology is a new creation due to Paul. A great number of factors have been cited, which are said to have contributed to the development of the Pauline Christology: the all-dominating personality of Jesus, the vision of Paul who saw Jesus transfigured as a heavenly vision, and furthermore Jewish-Hellenistic doctrines of the celestial archetype of humanity, and quite recently Lueken calls attention to many parallels between the figure of Christ and the archangel Michael.[1] All this may have contributed its influence, but all these together are not the decisive factor. First of all, for instance, the impression made by the historical Jesus: beyond question it is of immeasurable importance, but it can scarcely be maintained that this can have produced the conception of Christ proclaimed by Paul; indeed, "the humanly individual personality of Jesus has almost vanished in the portrayal of the apostle" (Wrede, p. 68); "Paul is absolutely not intelligible on the basis of the teachings of Jesus alone" (Wrede, p. 67). Knowing only the Christology of Paul, who would be able to derive from it the picture of the historical Jesus? And on the other hand, who that had made the acquaintance of the historical Jesus would ever conclude that such Christology as that of Paul would be the result? Think, for instance, of Paul's utterances regarding the cosmic significance of Christ; is the opinion that the world was created by Christ derived from the impression made by the person of Jesus?

Without doubt the doctrine of the archetypal man, which is

[1] Lueken, *Michael.*

perhaps of Jewish-Hellenic origin, played a part in this connection; but how can we explain the immense enthusiasm with which Paul proclaims Christ the son of God? Certainly not from speculation and philosophy, but from a religious sentiment which pervaded him wholly. The figure of Michael furnishes many parallels, but this comparison is lame at the most important point: Michael is a servant of God, Christ is the son; moreover, the figure of Michael rouses no such enthusiasm in Judaism. And in the face of all these conjectures there is this to be said: Is it in any way possible to think that Paul himself created this figure of Christ in its essential features? Paul lives for this Christ: "Christ is my life;" he receives everything from him: justification, salvation, sanctification, new life; he is ready to give up everything for him. This Christ is not to him a creature of his imagination, but a reality. This Christ cannot be merely an immense projection of his own subjective experiences. As Holtzmann has said, the pre-existence of Christ cannot be accounted for as a "theory by rhetorical manipulation"; this image of Christ must needs have been given to him or at least have been prepared for him in some way, if he could feel willing to sacrifice his whole life to this Christ.

Hence we think that any one who undertakes to explain Paul's conception of Christ must at the same time explain particularly the religion of Paul with which this conception is connected and in the midst of which it stands. All great religious experiences are examined by Paul and tested in the light of the person of Christ, of his cross and of his resurrection: what took place in these connections was not simply an individual experience which may be of importance, as is common among men, in the way of imitation by other men, but these were a series of facts which had a fundamental and immediate importance for God and the world. In the name of Christ great and world-ruling powers are vanquished, the whole world of this carnal life is slain by his death, and a new world rises in his resurrection. This is really the kernel of the faith of Paul: that what was accomplished through Christ was achieved not for him but for the whole human race. These are great religious thoughts which are wholly without parallels in the

history of the Old Testament and of Judaism so far as they are in our ken, and for which we cannot find in that history even the means of transmission.

But it becomes clear to us from whence this religion comes when we consider the character of the figures which it introduces. Here we find Christ a celestial personage, the foremost of all beings next to God, the image of the Invisible whom he reveals, in whom dwelleth all the fulness of the godhead, the firstborn of all creation, in whom all things are created and have their being. And what does he tell us of this heavenly personage? That he humbled himself and took on human form here below; that he died a shameful death but experienced a glorious resurrection and was raised up above all creatures. The powers that rule the earth, thus we read in one place, did not recognise him, else they would not have brought him to the cross. And in another place, that he stripped powers and principalities and made of them a public mockery. Soon he will return and destroy the man of sin by the breath of his mouth; he will vanquish all powers and principalities until he shall surrender the rule into the hands of God.

We cannot help asking, What sort of utterances are these? Where shall we find their like? It is the merit of Wernle to have announced the clue to all this, repeating it over and over again in his book without indeed being aware that it is the clue; it is the word "mythology." Where else is there an instance of other divine beings by the side of the supreme god, of the supreme god remaining inert while another being, similar to him but subordinate to him, officiates in his stead, of this god appearing on earth, dying, being resurrected, ascending up to Heaven and there being glorified? All this is commonplace in other religions. But in particular the mythological character is seen in the manner of judging the actions of Christ. For this is precisely the characteristic feature of the stories of gods, that along with the divine personages are understood and involved principles: thus in the dragon myth that we have treated, the kingdom of light is regarded as the sun-hero, while darkness and water are personified in the dragon. Everything that the divine personages do has some direct and fun-

damental significance. Christ in his resurrection brings life to light, and we share this with him if we attain to the mystical union with him, so that Wernle is right when he says: What Paul utters in regard to Jesus is at bottom a myth, a drama for which the name of Jesus furnished the title.

And is this any occasion for surprise? Recall the many remnants of myths which we have already found in the Christology of the New Testament. How many different personages had been identified with Jesus: the magician god of the fifth chapter of the Apocalypse of John, the rescued sun-youth and dragon-vanquisher of chapter 12, the supernaturally begotten hero of the story of the infancy of Jesus, and he who went down into Hell and arose to Heaven! All this was transferred to Jesus, because it had been attached to the Christ before, and this, we maintain, is the secret of the whole subject of New Testament Christology. The outline of the celestial Christ must have been in existence somehow already. Now we know from some fragments in the Jewish Apocalyptic writers that such beliefs existed in certain Jewish circles. We have seen that some centuries earlier a similar belief had reached the prophets and had by them been most vigorously assimilated to the belief of Israel. Although born in paganism, this figure of the celestial Christ had now so captivated the hearts of men in Judaism that they could no longer free themselves from it. Their hearts already believed in a divine revelator, a union of the human and the divine in action, and a confirmation through sacraments. In precisely what forms this belief existed, we cannot at present say; there is a great gap in our knowledge at this point! Later Judaism in its opposition to Christianity obliterated the most of the similarities. In 4 Ezra (vi. 1 ff.) we have a trace of such polemics: we read there that the end of the world is to come about through no one but the creator himself.

But although we know practically nothing of this form of belief in the Christ among the Jews, yet we must presume it for any proper understanding of the New Testament. When Jesus appeared in his superhuman dignity, when he won all hearts to himself, and his disciples believed that he was the Christ, his enthusi-

astic followers had attributed to him the greatest honor known to Judaism.

Now this Christology was not developed to explain the mystery of his personality (as though Jesus were the essential or primary element and the Christology secondary), but rather the souls that were longing for the presence of God, who felt the need of a son of God who should descend from Heaven, transferred to Jesus all the ideals of their hearts. Thus New Testament Christology is, as it were, a mighty hymn sung by history to the praise of Jesus. And the charm which is exercised by this notion of the son of God who descends to earth is to be read in the entire history of Christianity unto the present day.

It is evident that this figure of the celestial Christ is not in the last analysis to be reconciled with monotheism; it was originally begotten amidst polytheistic environment,—this image of a second God who reveals the supreme God. This is the reason why genuine Judaism rejected this conception of Christ. The scholars of the Christian Church have labored for centuries to harmonise these irreconcilable factors.

We have reached our conclusion. Christianity is a syncretic religion. Important religious elements that came from foreign sources are contained in it. These must have entered into the primitive Church immediately after the death of Jesus. The Christianity which was destined to be preached to many nations was itself not the product of one nation, but sprang from the complex history of many nations.

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DISCUSSIONS.

A NEW CLASSIFICATION OF THE SCIENCES.[1]

When a man has studied a problem for over twenty-five years, and then submits the results of his researches to the thinking world, his opinions certainly deserve more than a passing mention or a hasty review. This is the case of Prof. Adrien Naville, the Dean of the Philosophical Department of the University of Geneva, Switzerland. Lately he has condensed, within less than 200 pages, his ideas on the classification of the sciences,—a problem he has never lost sight of entirely, even when working in other lines.

The question, indeed, has grown in importance lately, owing to the new and more intimate relations which have been established between philosophy and science. After the grand, but illusory, speculations of the German Idealists in the first part of the nineteenth century, it looked as if philosophy was to fall forever a prey to metaphysics. And as this was also the period of the sudden and victorious efforts of the so-called positivistic sciences, which formed the honor of the last century, the rivalry only became more acute, and to many the rupture seemed definitive and irremediable.

But it was a false alarm. The old Aristotelian method combining observation and study of the real world on the one hand and speculation on the other, was bound to come to the top again. The last echoes of a long hostility proved more noisy than dangerous; and if they produced some sensation among people interested in these discussions, no true and conscientious scholar has allowed himself to be disturbed.

Thus everybody agrees that science and philosophy must proceed hand in hand; which does not mean, however, that their respective positions have as yet been clearly defined. Professor Naville's book reflects this situation very faithfully, indeed: reconciliation between the two on the one hand, but uncertainty concerning the method of collaboration on the other. Mr. Naville himself admits, with a frankness rare in a writer, that many a question remains open, and that

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[1] *Nouvelle classification des sciences. Étude philosophique.* Par A. Naville. Second, completely revised edition. Paris. Felix Alcan. 1901.

several merely provisional solutions will be found in the new scheme of the work which he proposes to the combined efforts of the laborers in all the different fields.

He first distinguishes between two possible principles of classifying the sciences: the objective principle which divides them according to their objects of investigation (botany which studies plants, astronomy which deals with stars, psychology which investigates the problems of the soul, etc.), and the subjective principle which classifies sciences by taking as a starting-point the specific way in which the subject reacts upon reality. The best known of these classifications is that of Bacon later also taken up with a few modifications by the French Encyclopædists of the eighteenth century: Man can approach the phenomenal world by three faculties of his mind,—memory, reason, and imagination; hence three great groups of sciences: history, philosophy, poetry,—and their subdivisions so entirely obsolete now.

The author of the *nouvelle classification* is in favor of the subjective principle; but giving up the old psychology of the faculties of the mind, he takes man as a whole, and the scientific attitude the latter can assume in face of the world is according to him a threefold one. He can ask: What is possible? What is it that actually is? What ought to be? From these three questions proceed three groups of sciences: those of the laws which govern the universe (*la théorématique*), those of the facts (*l'histoire*), and those of the ideal rules of action (*la canonique ou la poiétique*).

In his very sharp distinction between "laws" and "facts," Mr. Naville, it seems to us, has anticipated the spirit of the philosophy of to-morrow. To study laws—which in our modern system of thought correspond to the "types" or "ideas" of Platonism—was, in the past, one and the same thing as to study facts. To know the former was to know the latter also. It is hardly necessary to recall to mind such metaphysical systems as those of Spinoza,[1] Fichte, Schelling, and Hegel. To-day our philosophy is physical, that is, is based on our empirical knowledge of nature. In other words, laws are deduced from natural facts, and not natural facts from laws; or again, the facts are not in the laws, but the laws in the facts. This principle is not new. Not to go back to Aristotle and the Arabians, to Bacon and the Encyclopædists, Comte had taken it up and for the first time tried to apply it systematically through the whole range of human knowledge in his imposing *Cours de philosophie positive*. The progress of science has only confirmed its value. But the danger of an excessive reaction against the classical or metaphysical point of view has not been avoided by the majority of modern scientists. Just as it has been attempted to reduce the facts to a mere

[1] It is just, however, to recognise that a metaphysical system, in the strict sense of the word, is impossible and has never been conceived; a minimum of experience must always be allowed, even to *a priori* constructions like Platonism or Spinozism. See on this point our article in the *Revue philosophique*, January, 1899.

expression of *a priori* laws, an attempt has been made under the pressure of an altogether badly understood positivism, to reduce laws to facts. Not very long ago, a very strong inclination on the part of several scholars was noticeable, to doubt the validity of the very notion of law. Such extreme views could not in any event last forever, but a vigorous protest was necessary, and Mr. Naville will have been among the first to enter upon a new and undoubtedly more rational path, in according, so far as science is concerned, an independent and equal value to facts and laws.

We notice, however, that the *Théorématique* has been placed before the *Histoire*. Now, at the risk of being ourself considered a *réactionnaire*, and too much inspired still by the spirit of the science of yesterday, we feel inclined to think that Professor Naville has made undue concessions to the older metaphysical tradition If we wish to remain true to the modern point of view—which is indeed that of the *Nouvelle Classification*,—facts must come before laws: we deduce the laws from the facts; thus the historical sciences (by which the author means all the concrete sciences, such as astronomy, geology, physical geography, as well as human history in its different branches) must precede the theoretical sciences. It is very true that frequently we re-explain certain facts of history by the very laws which have been obtained from history; for instance, the laws of development of a given form of government which we have discovered while studying the history of one country, are applied by us afterward to the explanation of phenomena of the same nature in other countries. But according to Professor Naville, the true importance of both historical and theoretical sciences lies not in this reciprocal action,—though a great many scholars seem to delight in this rather shallow and aimless kind of work,—but in their practical application in the preparation of the world of the future. In other terms, they owe their importance to the existence of a third group of sciences,—that of the ideal rules of action. (See pp. 18–19, 145 et seq., "La question poiétique.")

One may be surprised at our criticism. The order followed by the author,—viz., What is possible? What is it that is? What is it that ought to be? seems at first sight very logical. It is so as long as one does not distinguish—but Mr. Naville does it very carefully elsewhere—between the metaphysical and the physical conception of phenomena, or better between the absolute and the relative standpoint. Absolutely speaking, the laws which govern phenomena must of course preexist. But the absolute standpoint is precisely not that of science; it cannot be; indeed, if science has gained such great victories in the practical world, it has only been by giving up all kinds of pretensions to the absolute. If, in itself, the logical order is that which goes from the cause to the effect, then, conversely, from the relative point of view of human knowledge, the logical order is that which goes from the effect to the cause. In other words, the laws are indeed prior to the facts, but the knowledge of the laws is after the knowledge of the facts; it is the history of human societies which has revealed to us the existence of sociology, and not the

contrary; it is the study of botany which has enabled us to formulate the laws of the growth of plants; it is the observation and description of stones which has provided us with the basis of mineralogy, and so forth; none of these groups of laws as known to us is *a priori*. Everywhere science has proceeded from history to theory.

One reason—besides that mentioned above—which may have induced Mr. Naville to adopt the order criticised by us, is that he has not deemed it necessary to separate his *Nomologie* from his *Théorématique*, but has put both together in a chapter following the *Histoire*. The advisability of this procedure is at least open to discussion. It seems that the fit place for the *Nomologie* was before and that of the *Théorématique* after the *Histoire*. The *Nomologie* answers the question, "What is it to know?" In fact the answer is presupposed by the term used (*Nomologie* = the science of the concept of law), and the phrase, theory of knowledge, which does not imply anything beforehand, would be preferable. We agree, however, in this, that we are looking for an order that prevails in the universe, and that we will have a principle of order if we succeed in discovering constant relations between phenomena; in other terms, if we reach the conclusion that the concept of law is the principle looked for. Now what one ought to understand by the word law, the elements which constitute the concept, the absolute or relative value of its revelations, its subjective or objective character, and so forth, that is the field of *Nomologie*. Thus the latter is not a science, as Professor Naville seems to suggest, but an introduction to science. As such it ought to be made to precede any study of reality, historical as well as theoretical, since it shows in what spirit we can approach this study. Not so with the *Théorématique* which has nothing to do with the general notion of law, but only deals with concrete laws, astronomical, psychological, social, etc.,—laws which, we repeat, we do not get at by pure reason, but through historical knowledge; laws which are only within our reach after the study of facts.

If we were to examine the subdivisions of both groups of sciences, *Histoire* and *Théorématique*, as proposed by Professor Naville, we should find them a new argument in favor of our point of view. As far as the historical sciences are concerned, the subdivision is in itself of no importance whatsoever. One thing only is certain, namely, that it is impossible for one scholar to embrace the study of universal history. It will therefore be necessary to adopt the method of a division of labor. But as science is not yet, at this stage of the process, in possession of a principle for systematic classification, it will be forced to take as a basis the objective appearance: the one will investigate the history of the stars, and the other the history of the earth, of plants, of the different branches of human history. This is purely conventional, and so it will continue until the scholar finds himself prepared to pass on to the *Théorématique*; for then we shall know which phenomena obey which laws; the historical facts will reveal that, but it is necessary to wait until they have taught us. That they do modify very often the data of com-

mon sense, no scholar can doubt to-day. Professor Naville writes in the very first pages of his book: "The distinction between physics and psychology, for example, remains profound; but it is, however, only a secondary distinction, not as profound as that which exists between psychology and political history, or between psychology and ethics."

We must now say a few words with regard to the third group of sciences proposed by our author, the group of the "sciences poiétiques" or of the ideal rules of action. From the very start we have to face the big problem of determinism or contingency in the laws of nature. It is easy to see the importance of it here: Suppose the existence of contingency (or liberty) duly established, a new factor will have to be taken into consideration in the science of the phenomena of the future, a factor not met with in the *Sciences théorématiques*; the *Canonique* would not be a simple prolongation or application of the latter. If, on the contrary, contingency is found to be no factor in the evolution of phenomena, a new group of sciences becomes all at once useless; for in this so-called group, what could be done except draw the conclusions from the *Théorématique*: given such and such facts and given such and such laws, such phenomena will take place? It would be a mere repetition, only with regard to the future, of what has just been found in the theoretical sciences.

A strong reaction has for some years been noticeable in favor of moral liberty as against determinism. It is manifest more or less in all domains of human activity and thought, in literature, in philosophy, in several forms of mystic theologies, even in physics. The book of a countryman of Professor Naville, the eminent physicist Raoul Pictet (*Étude critique du matérialisme et du spiritualisme par la physique expérimentale*, Genève, 1896) may here be recalled.[1] Professor Naville

[1] The theory of the *potential* of M. Pictet—which Professor Naville occasionally mentions and which ought to be according to its author a starting-point to establish later the existence of moral liberty—is ingenious but worthless. To our knowledge it has found only very scanty approbation in the scholarly world. M. Pictet speaks for instance of the spring, which as long as it remains in a state of tension does not produce all the energy which it could under other circumstances produce. The force is therefore inactive for a certain amount of time; this is "potential" or virtual energy. This means in two words to contradict the law of the constancy of energy. Who does not see, however, the weak point of this argument? The energy is manifesting itself all the time; only instead of doing it all at once within a fraction of a second, it does it slowly and gradually. Keep the spring in the state of tension for a rather long time, it will produce less force when you relax it; keep it in the state of tension long enough, it will no longer produce any energy at all. The example of the stone is not better: a certain amount of energy is required to raise the stone to such and such a height; place the stone on a plank at this height, it will (by its mere weight) manifest only a small amount of energy, by far smaller than the amount that was necessary to take it up; but when the stone falls down, it will give back the virtual energy or "potential." A child could point out the fallacy of the statement. As long as the stone rests on the

is far from being ill disposed towards such attempts. He comes back to the subject several times in the course of the book, and it is even with reference to this point that he expresses one of his most original theses, namely that the spirit of the theoretical sciences, thus of science itself, is fundamentally opposed to determinism (*est foncièrement contraire au déterminisme*). From what has been said above, it is easy to understand how the author reached this point of view: the object of science is a practical one; we would not take the trouble of investigating patiently in order to discover laws of nature, if there was not within us an intimate conviction that we can, by means of them, have an action on the future.

As to us, we feel certain that there is here a deep misunderstanding, and in spite of the fact that the problem has been discussed over and over again, the essential point has not very often been brought to light. It is a mistake to object to the use of the concept of liberty in practical life. It represents with a considerable number of men a powerful spring of action. Only it has nothing to do in science. The strongest proof that it is an intruder there is seen precisely in the tremendous efforts made from antiquity down to our days to find a place for it. There is no more forcible argument against liberty in science than voluminous and classical treatises such as Leibnitz's *Théodicée* or Kant's *Kritik der praktischen Vernunft*. Like so many books written either before or after, they clearly indicate that there is no *natural* place for liberty—and thus contingency—in science: everybody knows it, implicitly recognises it; but since it was thought that in removing this notion from science, it was removing it at the same time from life as a moral factor, considerable pains has been taken to find some excuse in order to keep it in science too.

To quiet those who are afraid, it will be enough to insist upon this: All our sciences, all our knowledge, rest on a conventional agreement. This agreement is determinism. Without determinism no science is possible. The scholar will maintain this in spite of any protest. It is his right to do so,—the condition of his achievements. But if this is granted to him, he will very willingly recognise that this science, resting upon determinism, has no pretention of being absolute or perfect. If you do not embitter him with unfair attacks and quarrels of the theological, ethical, practical, and sentimental fashion, he will go even farther than that; he will tell you himself that determinism is obliged to take up in his system of science contradictory data. And we mean not only the indirect and practical results of theories not thoroughly worked out, but the very principles of knowledge are not consistent among themselves. We explain: Determinism is imposed upon the scholar

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board, gravitation is simply checked, which would otherwise cause the stone to fall. When the pressure of the plane is removed, gravitation manifests itself again. The pretended potential is in no way in the stone, but in the attraction of the earth or whatever the cause of gravitation may be, a force which does not discontinue to act for a moment.—The other cases quoted by M. Pictet could be as easily refuted.

not so much as a result of empirical observation of the world, but first of all as a result of the conditions of perception and of thought. We perceive, we conceive, and we think and reason according to laws: these laws *determine* our knowledge *ab ovo*. The subjectivism of science has been established, as well known, by Kant, but it must be confessed that the actual service rendered by him has not yet been fully realised. These very laws of thought, from which we can escape only in not thinking, impose upon us the famous antinomies of reason. We must conceive of the world as finite, for if we add to each other, or if we imagine that we add to each other, the finite parts of space, we cannot but obtain a finite total. But we must at the same time conceive of the world as infinite; for neither our imagination nor our intellect can think of a limit beyond which there would be no more space. This goes to show plainly that science will never be an adequate knowledge of truth, since truth cannot be contradictory; the universe cannot be at the same time finite and infinite. Only for the systematic conception which we can have of it, it will be necessary to conceive it, conventionally, now as finite, now as infinite.

And conventionalities grow more numerous as we proceed farther on into science. Professor Naville quotes several of them; for instance, the pretended regular geometrical lines traced by the stars. In other cases it is very obvious that they are no longer quoted as conventional, such as the atoms and molecules in physics and chemistry,—nobody has ever seen them; it is probable that they do not exist at all; but their existence is conventionally acknowledged, for it renders investigation easier. Let some one invent another hypothesis which will favor the scholar's researches to a still greater extent, and it will at once take the place of the old tconventionality. Again, who knows anything about the so-called magnetic force, about electricity, affinity? "Words, words, words," the enemies of science may say. Very well; but words thanks to which we are able to understand one another. A meter is something entirely conventional, the meter does not exist in nature: what a powerful help, however, to know nature and act upon it!

On such conventional agreements we succeed in building up a science of the relations of phenomena, a science of determinism. Our first aim in science is to be able to say: that which has been, and that which is, had to be. If now we wish to know the future scientifically also, it will only be in accepting the parallel formula: that which will be, will have to be. Thus we come back to our thesis: There is no special group of canonic sciences; what Professor Naville calls by this name seems to us to be only a series of applications to the future of the scientific data gathered by the *Théorématique*.

We may finally add this: Admit for a moment that there exists really an element of contingency in nature, this would not yet be sufficient to induce the scholar to make a special group of sciences with the *Canonique*. For, this element of contingency or liberty thus introduced into scientific problems would be, by definition, an unknown and unknowable quantity. All that might be granted in this case

would be, that there is a place for a special group of future realities where other than scientific factors will be active, but this domain would then fall outside of the scope of science.

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A STRANGE APPLICATION OF MATHEMATICAL PROBABILITIES.

Poincaré concludes his lectures on the calculus of probabilities[1] at the Faculté des Sciences of Paris with the following skeptic statement: "The calculus of probabilities offers a contradiction in the terms itself which serve to designate it, and, if I would not fear to recall here a word too often repeated, I would say that it teaches us chiefly one thing: i. e., to know that we know nothing."

This opinion of the great French scientist applies in particular to the so-called moral sciences which Condorcet, Poisson, and many other, including even Laplace, attempted to improve by the theory of probabilities. Most of these applications are, as Stuart Mill said, the scandal of mathematics.

In the lines which follow, the writer presents a recent example of this kind, which in his opinion is worse than any of those proposed by Condorcet.

In Professor Lehmann's[2] book on *Aberglauben und Zauberei* (German translation by Dr. Peterson, published by F. Enke, Stuttgart, 1898). on pages 440 and 461, the following statements may be found:

At the first international congress for experimental psychology at Paris, 1889, it was decided to gather statistics and reports on hallucinations. The result of this collection has now been published in two interesting books. One was published by a committee of the Society for Psychical Research, under the direction of Professor Sidgwick, and has the title, "Report on the Census of Hallucinations," Vol. X. of *The Proceedings of the S. P. R.* (date of publication is not given by Dr. Lehmann). The other, *Ueber Trugwahrnehmungen*, was published by Parish (Leipzig, 1894). In the first report, according to Dr. Lehmann, it is stated that "in England and Wales the annual death-rate since the last ten years was 19.15 out of a 1000. If every year 19 die out of a 1000, 19 die every day out of 365,000, or, in other words, 1 out of 19,000. This number $\frac{1}{19000}$ indicates the probability that a person dies on the very day when his body is seen in a hallucination, provided there is no connection between the two events. It may therefore be expected that out of 19,000 hallucinations one will occur during the hour corresponding to the time of death of the person which is due according to the statistics. After the committee had discarded all doubtful cases and taken account of many forgotten

[1] *Calcul des probabilités*, G. Carré, Paris, 1896.

[2] Director of the Psychophysical Laboratory of the University of Kopenhagen.

hallucinations, it obtained the result that out of 1300 hallucinations[1] of living persons, 30 persons died 12 hours before or after those 30 respective hallucinations. This gives for the actual probability of the coincidence of hallucinations and cases of death 30:1300 = 1:43, while the theoretical probability is 1:19000; the real number is therefore 440 times greater. Consequently, there must be a special cause for this coincidence." . . .

Now let us see upon what assumptions this remarkable conclusion is based. There is no doubt that $\frac{1}{19000}$ is the approximate probability that out of 19,000 persons in England and Wales a certain one will die on the day considered. This probability can be no other probability and it seems absurd to link it with the entirely different problem of hallucinations which has nothing to do with the mortality of a country. In fact, the number $\frac{1}{19000}$ could be applied to the statistics of hallucinations only when every inhabitant of England and Wales would have one hallucination per day. Furthermore, those 1300 hallucinations are presumably scattered over periods of weeks, months, and years, so that also for this reason it is impossible to make a reasonable comparison of a probability resulting from events which occured during several years, with a probability limited to one day. The probability of life and death as considered in statistical computations is entirely different from that resulting from hallucinations and deaths. Finally it makes a very great difference whether the 30 cases of death occur within or without the circle of 1300 persons having hallucinations. Hence, the comparison of the two probabilities cannot be justified, and the conclusion that a certain unknown cause produces said probability of $\frac{1}{43}$ is illusory.

According to the data of the Sidgwick Committee, $\frac{1}{43}$ is the probability that a hallucination will come true. This probability is quite small. To indicate a definite cause for the coincidence of hallucinations and death, the probability would have to be at least $\frac{1}{2}$. The probability of $\frac{1}{43}$ is therefore rather a disproof for a certain cause, and I should describe it as an accidental synchronism.

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[1] It is not stated what kind of hallucinations.

BOOK REVIEWS.

DIE BIOGENHYPOTHESE, EINE KRITISCH-EXPERIMENTELLE STUDIE ÜBER DIE VORGÄNGE IN DER LEBENDIGEN SUBSTANZ. Von *Max Verworn*, Professor der Physiologie und Direktor des physiologischen Instituts an der Universität Göttingen. Jena: Verlag von Gustav Fischer. 1903. Pages, 114.

The indefatigable author, Max Verworn, professor of physiology in the University of Göttingen, publishes his views concerning the theory of life, in a special brochure, because he thought an extended report of his own experiments and conclusions would be out of place in a text-book on physiology. Accordingly, the present publication may be considered as a kind of postscript to his larger work. The subject is as important as it is fascinating, and although the author has not succeeded in giving a definite solution of the problem,—a result which the most sanguine physiologist would not expect under the present circumstances,—the reader will be indebted to him for valuable suggestions, and a condensed report of the work done by the author in the same line.

Professor Verworn refers to the fermentation theory which has recently gained so much ascendency, but without rejecting it proposes a theory of his own. The discovery of Prof. E. Buchner, published in his essay on alcoholic fermentation (Berlin: *Deutsche Chem. Ges.*, 1896, 1898, 1899), is based on the observation of the enormous activity of enzyms of all kinds, possessed of a character which proves the kinship of all zymic masses to vital processes of animal life. Professor Verworn calls those mysterious combinations which are the carriers of the life-process *biogens;* but he thinks that nitrogen rather than oxygen is the active element of the vital processes. He follows in this respect the English physiologist Allen, who seeks the mystery in the function of molecules, saying:

"It is a molecule of enormous size, and (so far as the dynamic elements are concerned) its various groups are linked together by many nitrogen atoms, which are placed internally but not in chain. It is not a proteid, a cyan-compound, an amid, an amine, nor an alkaloid, but something that can yield some of these during life and others at its death. Death consists in the relaxation of the strained relationship of the nitrogen to the rest of the molecule. When thus 'the silver cord is loosed' the released groups fall into a state of repose. Most of these groups are

proteids in which the *N* is peripheral, triad, and unoxidised, having yielded its *O* to some other element: if however such a proteid molecule be applied to a living cell, it can be linked on again by its *N*, which thus once more becomes central."

In the same way, Professor Verworn believes that in the center of metabolism there is a highly complicated labile structure which by assimilation and dissimilation performs the vital processes. He seeks the seat of biogen in the protoplasm, but not in the nucleus, and thinks that it is a very complicated nitrogenous carbohydrate. The living cell contains a reserve of oxygen as well as of nutriments, but this oxygen is latent and the reserve of nutriment is considerable. Professor Verworn does not believe that he has solved the problem, but he thinks that his hypothesis is fruitful and may be serviceable as a guide in further speculations and experiments. While the biogen hypothesis is rather a continuation of the old physiological views, he trusts that it is not in contradiction to the enzym hypothesis, and believes that in all essential points the results of the two will be found to be compatible. P. C.

DIE NEURONENLEHRE UND IHRE ANHÄNGER. Ein Beitrag zur Lösung des Problems der Beziehungen zwischen Nervenzelle, Faser, und Grau. Von *Dr. Franz Nissl*, a. o. Professor in Heidelberg. Mit 2 Tafeln. Jena: Verlag von Gustav Fischer. 1903. Pages, vi, 478. Price, 12 Marks.

The neuron theory is at present pretty generally accepted by physiologists, but our author, Prof. Franz Nissl, of Heidelberg, deems this theory to be a general misfortune because it endangers scientific progress. According to the neuron theory, the nervous system, and especially the brain, is comparable to a forest which, from a certain distance, appears like a carpet and spreads over a range of hills. In spite of the continuity of the green texture, we know that its elements consist of single trees whose spreading branches intertwine. Their processes may be very long, according to the conditions of their growth, but after all they all have a central origin somewhere, and the whole is a conglomeration of single individual cells. This theory was in the air long before it assumed concrete shape. It was first suggested by the different directions of the sensory and motor fibres in which growth and trophic characters always followed the same lines. Through Golgi's method we learn to distinguish between sensory and motor fibres, and Gudden formulated the theory in a definite law. Waldeyer gave a name to the new unit by calling the nervous cell with its several processes a neuron. Ramón y Cajal is one of the most prominent defenders of this theory, which in Germany is also represented by Hoche, Verworn, His, Edinger, Lenhossec, etc. Professor Nissl considers the development of sensory and motor fibres on trophic lines, but he denies that the neuron theory satisfies the conditions of the adult brain. He thinks that there is another element unaccounted for which cannot be regarded as a mere outgrowth of the neurons; and this is the gray substance of the nervous system. He deems its existence as an independent element an undeniable fact;

and its histological structure, as well as its connection with the cells and fibres, is in his opinion an unsolved problem still.

The present book is Nissl's polemics against the several representatives of the neuron theory, and a word of warning not to forget that the neuron theory is a mere hypothesis which, as he claims, stands in contradiction to facts. Naturally, he insists that the neuron theory cannot be regarded as the key to a comprehension of neuropathology and the theory of degeneration. A few plates illustrating his views are appended to the book. P. C.

DIE ELEMENTE DER METAPHYSIK. Als Leitfaden zum Gebrauche bei Vorlesungen sowie zum Selbststudium. Zusammengestellt von Dr. Paul Deussen, ordentlichem Professor der Philosophie an der Universität Kiel. Dritte, durch eine Vorbetrachtung über das Wesen des Idealismus vermehrte Auflage. Leipzig: F. A. Brockhaus. 1902. Pages, xliv, 271.

The Elements of Metaphysics by Dr. Paul Deussen has appeared in the third edition. The work has been translated into English and French and the present edition is slightly increased by a few additions. The spirit of the book and the whole conception, which is practically a Vedantism transferred and adapted to Kant's criticism, has remained the same as in the first edition. It is perhaps the most characteristic work of the author, who is known not only as a metaphysical philosopher but also and especially as an Orientalist and a translator of several Sanscrit works. Our divergence from the author's views has been set forth in our review of the first edition, and also in the review of his *History of Philosophy*, so there is no need of entering into the subject further here. P. C.

NIETZSCHE DER "ANTICHRIST." Eine Untersuchung von *Prof. Dr. Paul Schwartzkopff*. Leipzig: Verlag von W. Schäfer. 1903. Pages, 67.

The last philosophical book which Nietzsche wrote was entitled *The Anti-Christ*, for Nietzsche was proud of his hostility to Christianity. Accordingly, Professor Schwartzkopff compares him to Julian the Apostate. In his childhood Nietzsche was pious. His school-mates called him "the little pastor," and in his fifteenth year he wrote poetry of unusual fervor, breathing a holy zeal for salvation and forgiveness of sins, and finding comfort in the belief in Jesus Christ. In his twentieth year he still addressed in his poetry the unknown God, and he begins to lose his faith with his study of philosophy. He was first under the influence of Schopenhauer, but being predominantly an individualist he soon cut loose from the great pessimist and developed an original line of thought, in which in contrast to Schopenhauer's negativism he attempted to become a representative of an affirmative philosophy. It is then that he proposed to recoin all values and to change the traditional conception of good and bad. He objected to love and sympathy, the ideal of Christian and pessimistic ethics, which he criticised as a weakness.

He replaces it by the ideal of the "overman," who stands beyond good and evil, and culminates in enmity to religion.

That Nietzsche should consider himself the Anti-Christ is only an evidence of his megalomania. Schwartzkopff, taking the standpoint of the Christian, claims that "we Christians are to a great extent not without faults in Nietzsche's aberrations, for in several important points Nietzsche did not aspire for anything different than that for which the true Christianity aims." His "overman" is, as Schwartzkopff claims, nothing but the child of God who, after a complete conquest of sin, has acquired the possession of perfect virtue and undisturbable peace. Nietzsche's ideal is the heroic conquest of suffering, which he wrongly glorifies as an anti-Christian virtue. Thus, Schwartzkopff declares that the ultimate motive of his fanaticism against God and Christianity is nothing but his unsatisfied hunger for God, and so he compares him to a man who, disbelieving in the loyalty of his wife, rails at her but at bottom only proves that he still loves her. P. C.

NIETZSCHE'S ERKENNTNISTHEORIE UND METAPHYSIK. Darstellung und Kritik. Von *Dr. Rudolf Eisler*. Leipzig: Hermann Haacke. 1902. Pages, iv, 118. Price, 5 M. 20.

Abundant as the literature on Nietzsche is, no one has as yet thought of setting forth his purely theoretical philosophy,—a task which Dr. Eisler has here accomplished. The author believes he has discovered in Nietzsche's thinking at least a unitary, if not a systematic, connection of the fundamental ideas,—and this despite many inconsistencies and *lacunæ*. He has even detected in Nietzsche's works elements similar to ideas expressed by Mach, Ostwalt, and Wundt. Nietzsche's philosophical system is, according to Dr. Eisler, a species of naturalistic pantheism.

HEGEL'S LOGIC. An Essay in Interpretation. By *John Grier Hibben, Ph. D.*, Stuart Professor of Logic in Princeton University. New York: Charles Scribner's Sons. 1902. Pages, x, 313. Price, $1.25 net.

The signs of the time, at least the signs of the world of books, point toward a revival of the study of Hegel, and Dr. Hibben's lucid exposition of the great German philosopher's *Logic* will be to many welcome. Hegel endeavored to incorporate in his *Logic*, says Dr. Hibben, "the essential principles of philosophy which in the development of the world's thought have forced themselves upon men's convictions, and have been attested by a general consensus of opinion." To understand Hegel, therefore, is equivalent to a mastery of the history of philosophy "in the salient features of its progress." Students unfortunately have been deterred from undertaking a systematic study of Hegel's works by his proverbial obscurity. But the text of the *Logic*, in Dr. Hibben's opinion, is "self-illuminating"; and in the belief that "the best commentary on Hegel is Hegel himself," he has sought to "simplify all technical terms....explaining their significance in the light of the definitions given by Hegel himself....and to render intelligible the fundamental

doctrines by means of simple statement and illustration." As to the importance of the study of Hegel's *Logic*, Dr. Hibben states that it is not only an excellent introduction to the German philosophy of the post-Hegelian schools, but that it is also the gist of a speculative system of abstract thought involving "an interpretation of life in all the fulness of its concrete significance." The author in an appendix has given a glossary of the more important German philosophical terms of Hegel's *Logic*.

GEORG WILHELM FRIEDRICH HEGEL'S GRUNDLINIEN DER PHILOSOPHIE DES RECHTS Mit einer Einleitung herausgegeben von *C. J. P. J. Bolland*, Professor der Philosophie an der Universität Leiden. Leyden: A. H. Adriani. 1902. Pages, CC, 336. Price, 5.50 florins.

JOHANN EDUARD ERDMANN'S ABHANDLUNG ÜBER LEIB UND SEELE. Eine Vorschule zu Hegel's Philosophie des Geistes. Neue Ausgabe. Leyden: A. H. Adriani. 1902. Pages, xvi, 128. Price, 1.50 florin.

The philosophical reading public is under considerable obligation to Professor Bolland for the publication of this new edition of Hegel's works. The present volume, *The Philosophy of Law*, to which the editor has supplied a long prefatory explanation of some hundred and seventy odd pages, is an important one in the history of politics. It appeared during the reactionary period following upon the so-called "War of Liberation" in Germany, and propounded a conception of the state which, while not greatly removed from the theory which now prevails in European governments, was not at all in accord with the temper of the age. It provoked criticism from liberal circles, and was proclaimed to be a glorification of the Prussian state, to which also it was not altogether acceptable.

The present edition is clearly printed, in large type, and will be found to be serviceable. Hegel's *Logic* and *Philosophy of Religion* have already appeared in this series, and his *Philosophy of History* is in the Press.

In the belief that we must in the present state of philosophical development go back to Hegel, as in the nineteenth century we went back to Kant, Professor Bolland has also caused a reprint to be made of J. E. Erdmann's now almost forgotten treatise on *Body and Soul* as an introduction to Hegel's philosophy. He offers this intelligible essay in the hope that the present antipathy to Hegelian thought will be removed.

L'ANNÉE PSYCHOLOGIQUE. Publiée par *Alfred Binet*, avec la collaboration de MM. H. Beaunis, V. Henri, Th. Ribot. Paris: Schleicher Frères & Cie., 15, Rue des Saints-Pères. 1902. Pages, 757. Price, 15 francs.

The French year-book of the work in psychology for the year 1901 is less bulky than its predecessor. The original memoirs are sixteen in number. Three are by C. H. Fréré, "The Influence of Rhythm on Work," "The Alternation of

the Activity of the Two Cerebral Hemispheres," "The Influence of Certain Nervous Poisons on Work"; five by A. Binet, "New Researches in Cephalometry," "The Increase of the Brain and the Face in Normal Beings from Four to Eighteen Years," "The Correlation of Cephalic Measures." "The Proportions of the Skull in the Blind," "The Proportions of the Skull in Deaf Mutes"; two by Larguier des Bancels, "Methods of Memorisation," "Notes on the Variations of the Memory in the Course of a Day"; V. Henry writes on the "Education of Memory"; K. Aars has a note on "Attention"; G. Abt an article on "Reflected Writing"; Marage on "Phonation and Audition" according to recent French work; Renault d'Allones has a paper on "Experiments Concerning Voluntary Effort in the Evaluation of Weights"; and Bourdon finally an "Inquiry Concerning Habits." The reviews and notices of books occupy some 192 pages. The "Bibliographical Table," which gives the titles of all books and articles which appeared on psychology and related subjects during the year 1901, covers 146 pages and contains 2985 titles. There is also an index of authors.

HARVARD PSYCHOLOGICAL STUDIES. Volume I. Containing Sixteen Experimental Investigations from the Harvard Psychological Laboratory. Edited by *Hugo Münsterberg*. New York: The Macmillan Company. Pages, viii, 654. Price, $4.00.

The *Harvard Psychological Studies* are now also appearing in the series of Monograph Supplements published by *The Psychological Review*. The first volume of these *Studies* contains 654 pages, and, owing to the heaviness of the paper, it is an extremely bulky one. The price likewise is bulky. The titles of the *Studies* are grouped under four headings: "Studies in Perception," "Studies in Memory," "Studies in Æsthetic Processes," "Studies in Animal Psychology," and "Studies in Psychological Theory." With the exception of the last paper by Dr. Münsterberg, the articles all represent *experimental* work done in the Harvard laboratory.

LE LEUCOCYTE ET SES GRANULATIONS. Par *G. Levaditi*. Scientia, Nos. 15 and 16. Paris: C. Naud, Éditeur. Pages, 159+28.

LES PHÉNOMÈNES DES MÉTAMORPHOSES INTERNES. Par *J. Anglas*. Scientia, No. 17. Paris: C. Naud, Éditeur. Pages, 83+28. Price, 2 fr.

We have had frequent occasion to refer to *Scientia*, a collection of books in which scientists of first rank are epitomising the results of the most recent investigations in their departments; and we are glad to note now the appearance of two more of these little books in the department of biology. M. Levaditi, who treats of the leucocytes and their granulations from both a theoretical and a practical point of view, is a student of Paul Ehrlich, in whose laboratory he made a very minute study of the white corpuscles of the blood. The importance of the subject

is not exclusively restricted to clinical hematology; there are many problems of general biology involved in it, which will interest others than specialists. The author has added an exhaustive bibliography of articles and papers which have appeared on this subject.

The second of these little books is devoted to the phenomena of internal metamorphosis. The author begins with the description of the simple phenomena of histogenesis which are prior to histolysis, and in reality merely a continuation of embryogenesis, which is a transformation rather than a metamorphosis, as these two terms are now distinguished. He then analyses the processes of histolysis so called, and finally he considers metamorphosis proper, which has as its immediate cause a biological change (a stoppage of nutrition, locomotion, etc.) which disturbs the chemical equilibrium of the intraorganic reactions. As a result asphyctic phenomena soon make their appearance, and so determine the processes of metabolic evolution.

L'ETICA EVOLUZIONISTA. By *Guglielmo Salvadori.* Studio sulla Filosofia Morale di Herbert Spencer. Turin: Fratelli Bocca Editori. 1903. Pages, xv, 476. Price, L. 10.

It has appeared to Dr. Salvadori that a calm and impartial study of Spencer's ethics based upon a sound and first-hand knowledge of his entire system is not only in itself a task of the highest importance, but imperatively necessary for a right understanding of Spencer in Italy, where he has been greatly misunderstood and misrepresented; hence the present exhaustive work, which is a continuation of a book presented in July, 1900, as a thesis for the doctorate, and which was found by the examining committee worthy of exceptional commendation.

Dr. Salvadori has endeavored to represent the real, as distinguished from the conventional, Spencer, and to show how the English philosopher has reconciled the apparently revolutionary results of science with the fundamental conclusions of the old philosophy. He looks upon Spencer as the great "Master of the Doctrine of Evolution," and as the first thinker to have considered the ethical facts in all their relationships, and so to have attempted a complete criticism of that practical reason which Kant had criticised only as empirical, not as pure. The bibliography shows the author to be widely read in the English and American literature on Spencer's ethics.

PROCEEDINGS OF THE ARISTOTELIAN SOCIETY. New Series—Vol. II. Containing the papers read before the Society during the Twenty-Third Session, 1901–1902. London: Williams and Norgate, 14, Henrietta Street, Covent Garden. 1902. Pages, iv, 240.

The titles of the seven papers constituting the contents of this volume are as follows: I. Alleged Self-Contradictions in the Concept of Relation—A Criticism of Mr. Bradley's "Appearance and Reality," by G. F. Stout; II. Recent Criticism of

Green's Ethics, by Bernard Bosanquet; III. The Philosophy of Probability, by Arthur Boutwood; IV. The Relation of Mathematics to General Formal Logic, by Mrs. Sophie Bryant; V. The Ethical Limits of Method in Philosophy, by G. F. Goldsbrough; VI. Mr. McTaggart's "Studies in Hegelian Cosmology," by G. E. Moore; VII. Mr. Bradley's Theory of Appearance, by H. W. Carr.

Die empiristische Geschichtsauffassung David Humes mit Berücksichtigung moderner methodologischer und erkenntnistheoretischer Probleme. Eine philosophische Studie. Von *Dr. Julius Goldstein*, Privatdozenten an der technischen Hochschule zu Darmstadt. Leipzig: Verlag der Dürr-schen Buchhandlung. 1903. Pages, 57. Price, 1 M. 60.

This brief study is concerned with a comparison of the philosophical points of view which underlie the philosophy of history of the eighteenth century, as expounded by one of its greatest exponents, David Hume. Hume's *History of England* marked an epoch in historical writing; it was empirical in its methods; it held ostensibly to facts, and emphasised very strongly the study of the sources. It exploded the reigning *a priori* theories and brought about a great extension of the domain of historical facts. And yet it was only the end of the *Aufklärung*, and not the beginning of a new period. A mighty work had been done, but it was philosophically meaningless. It involved a narrow, skeptical view of life, the outcome of the empiricism of the golden age of English philosophy. It knew no problems and no ideals, and looked upon nature and history as a purely empirical datum without meaning or significance. It remained for the literature and philosophy of Germany to make history the ideal and ennobling science which it became at the beginning of the nineteenth century,—to make it not only the offspring of empiricism, but also the offspring of reason.

Schillers philosophische Schriften und Gedichte. (Auswahl.) Zur Einführung in seine Weltanschauung. Mit ausführlicher Einleitung herausgegeben von *Eugen Kühnemann*. Leipzig: Verlag der Dürr'schen Buchhandlung. 1902. Pages, 327. Price, 2 Marks.

Friedrich Schleiermacher's Monologen. Kritische Ausgabe. Mit Einleitung, Bibliographie und Index. Von *Friedrich Michael Schiele*. Leipzig: Verlag der Dürr'schen Buchhandlung. 1902. Pages, xlvi, 130. Price, 1.40 M.

The literature of Germany in its golden period is distinguished from that of most other nations by having drawn inspiration and nutriment from contemporary philosophy. Both Goethe and Schiller were saturated with the philosophical thought of their period, and nearly all their more pretentious poetical works have a philosophical tinge. The present book of selections from Schiller's philosophical writings and poems will therefore be welcomed by all readers of German, and it is to be noted that the new curricula for the highest classes in the German gymna-

siums provide for a brief study of Schiller's philosophical writings. The editor of these selections, Dr. Eugene Kühnemann, has thoroughly discussed Schiller's philosophical attitude in his Introduction, and has endeavored to make his selections an organic whole by interpolating between them statements of Schleiermacher's poetical, artistic, and philosophical development between the years of their production.

Schleiermacher's *Monologues* has long been out of print, and hence practically inaccessible. Mr. Schiele has accordingly attempted to fill this gap in theological and philosophical literature by publishing a critical annotated edition of them. He has supplied a very complete bibliography of Schleiermacher's philosophical ethics and has prepared a good index, thus making the work a useful one.

THE PSYCHOLOGY OF EXPECTATION. By *Clara M. Hitchcock*. New York: The Macmillan Company. 1903. Pages, iv, 78.

This brochure is one of the monograph supplements of *The Psychological Review* and was submitted as a thesis for the degree of Doctor of Philosophy at Yale. It is an attempt to show the nature and importance of the psychological process of expectation, and considers the ideational, sensational, and relational factors herein involved, as well as the affective-tone and the forms and function of expectation. The author classes expectation as immediate and mediate, the latter being divided into reproductive and constructive. She finds the process to be re-active and hence apperceptive, thus showing many of the characteristics of attention, conation, and volition, but belonging nevertheless rather to the intellective than the emotional processes. As regards the relation of expectation to causality, she concludes that all complete knowledge involves anticipation, and affirms that all rational expectation is knowledge.

KANT'S LEHRE VOM GLAUBEN. Von *Ernst Sänger*, Doktor der Philosophie. Mit einem Geleitwort von Prof. Dr. Hans Vaihinger. Leipzig: Verlag der Dürr'schen Buchhandlung. 1903. Pages, xvii, 170. Price, 3 Marks.

Dr. Sänger's work received a prize from the philosophical faculty of the University of Halle, and now in its extended form he gives a complete historical and didactic treatment of the idea of faith as developed in Kant's philosophy. It is the author's aim to expound Kant's philosophy of faith objectively and accurately, and to refrain from criticism save in so far as the material itself absolutely and logically requires it. Not only have Kant's critical writings been drawn upon to this end, but his pre-critical productions have also been exploited. In his introductory note, Professor Vaihinger sketches the history of the treatment of Kant's idea of faith, which began twenty years ago with Ernst Laas's monograph "Kant's Position in the History of the Conflict Between Science and Faith." Dr. Vaihinger remarks that Kant was the first to make faith an integral component of philosophy itself, thus differing in his treatment of it from his predecessors.

THE PRINCIPLES OF LOGIC. By *Herbert Austin Aikens, Ph. D.*, Leffingwell Professor of Philosophy in the College for Women of Western Reserve University. New York: Henry Holt & Company. 1902. Pages, x, 489.

Dr. Aikins has written a very satisfactory text-book of elementary logic. In simple language he has expounded not only the traditional logic, but also that broader and more flexible art of reasoning and of detecting of fallacies which the accumulated common sense of the world has made the patrimony of nearly every branch of human action and endeavor. Thus, in addition to the usual chapters on propositions, laws of thought, inference, the syllogism and its figures, deduction and induction, we have also chapters on the meaning of words and sentences, the use of single words and phrases, the uniformity of nature, the logic of science, statistics, averages, probabilities, observation and memory, discovery of past and future events, testimony, evidence, and the tests of truth. The "algebra of logic" has been omitted altogether. The fourth figure of the syllogism has not appeared to the author to represent any distinct principle of reasoning, and has therefore in his judgment no proper place in the objective treatment of logic; but he has explained nevertheless the traditional way of dealing with it. The author likewise lays special stress on his treatment of deduction, which he has approached from an altogether objective standpoint, similar to that assumed in the treatment of induction.

The literature of logic has been well digested in this volume, and the numerous examples and illustrations which the author has culled from his own reading are pertinent. This text-book will undoubtedly meet with a favorable reception.

THE TUTORIAL ARITHMETIC. By *W. P. Workman, M. A., B. Sc.*, Assisted by *R. H. Chope, B. A.* London: W. B. Clive. New York; Hinds & Noble, Cooper Union. Pages, 553. Price, 3s. 6d., or $1.00.

We have before called attention in *The Open Court* to the admirable series of text-books published by the University Tutorial Press for the University Correspondence College of London, Eng. These books are especially adapted for self-instruction and contain an abundance of good explanatory material which most books leave for the teacher to supply. The newest book of the series is Workman and Chope's *Arithmetic*. While admittedly much hampered by the tyranny of the English examination system, the barbarous system of weights and measures, and the traditional divorce of arithmetic and algebra, the authors have produced a very useful book. A logical and scientific treatise on arithmetic, unimpeachable in all formal respects, they do not pretend to give. But they have made amends for this by offering much valuable material that is entirely missing in the ordinary text-book and which teachers at least will be delighted to have. The ample sections on Approximations and Contracted Operations are something that was greatly needed. The treatment of factoring, of the multiplication of fractions, and of compound proportion is claimed by the authors as novel, and much prominence has been given to questions

of theory. With the several works of the type of this *Tutorial Arithmetic* now in the field, there is no excuse for backwardness in teaching arithmetic.

DER NEO-LAMARCKISMUS UND SEINE BEZIEHUNGEN ZUM DARWINISMUS. Vortrag gehalten in der allgemeinen Sitzung der 74. Versammlung deutscher Naturforscher und Aerzte in Karlsbad am 26. Sept. 1902, mit Anmerkungen und Zusätzen herausgegeben von *Dr. Richard von Wettstein*, Professor an der Universität Wien. Jena: Verlag von Gustav Fischer. 1903. Pages, 30.

The papers epitomising the scientific research of the nineteenth century which were read at the Convention of the German Naturalists and Physicians at Hamburg in 1901, were unanimous in the opinion that the theory of descent constituted the general signature of the inquiries of the hundred years just closed. One aspect only, in the opinion of Professor Wettstein, was not sufficiently emphasised, viz., the growing ascendency of the Lamarckian doctrine of evolution; and he has accordingly endeavored in the present pamphlet to make good this deficiency. He reviews the general situation, and as a botanist offers certain considerations from his own science to show that the Lamarckian principle is coördinate in importance with the Darwinian. It is not possible to explain all the phenomena of the formation of new species by either of these principles exclusively. The Lamarckian and Darwinian views are not incompatible, but are equally justified as explanatory factors. Mutation and selection, inclusive of crossing, explain the rich variety of the organic world, but are insufficient to account for the gradual advancement of the general level of organisation. "In direct adaptation," he says, "we have a phenomenon which in response to the requirements of life brings about a gradual transformation of the organism, which, as the conditions of life are modified, produce a differentiation of the organs, permitting uninfluenced organs to persist, though in a reduced or latent form."

DIE DOGMEN DER ERKENNTNISTHEORIE. Von *Fred Bon*. Leipzig: Verlag von Wilhelm Engelmann. 1902. Pages, viii, 349. Price, 7 Marks.

The preface of Mr. Bon's work is an allegory. The form of exposition is a dialogue somewhat in the fashion of Berkeley,—a style of writing now slightly antiquated, but not without its importance. The spokesmen are Misodogmos and Episthemos, who is Mr. Bon himself in disguise. The discussions take the form of criticisms of (1) the Berkeley dogma, (2) the Aristotelian and Hume dogma, (3) the Kant dogma, (4) the Locke dogma, and (5) the Descartes postulate. The study of the works of these great epistemologists has led Mr. Bon to the conclusion that knowing in the epistemological sense is fundamentally different from knowing in the scientific sense, and that therefore the propositions which have been established as correct with regard to the one have no application whatever for the other. The dogmas of epistemology have, in fine, made it impossible for the results of epistemological research to hold good for the individual sciences. The solution is

to be found in a thorough analysis of the different concepts of knowledge and in the progression, not from dogmatism to criticism, but from an uncritical to a critical dogmatism.

Die Lehre vom Denken. Zur Ergänzung der naturwissenschaftlichen Psychologie in Anwendung auf die Geisteswissenschaften. Von *Adolf Bastian*. 1. Teil. Berlin: Ferd. Dümmler. 1903. Pp., 214. Price, M. 5.

Dr. Bastian, the Nestor of German ethnology, sends from Ceylon this first volume of his *Treatise on Thought*, which is to form the supplement and the culmination of his labors in the field of ethnic psychology. Just as the author has circumnavigated the physical globe, so likewise (in thought) he has simultaneously circumnavigated the intellectual globe, and, after having *observed* it in all the phases of its growth, he here proposes to describe its true nature. His method is the comparative genetic, and it stands to reason that with his enormous learning and experience he will have many apt and suggestive things to say.

The volume is said by both author and publisher to be a typographical *curiosum*. But when we reflect that it was a German book by Bastian set in an English office by Singhalese and Tamilian compositors, we shall be charitable in our judgment of the result. This combination is verily one difficult to "beat." But the contestants have proved their mastery of the situation, and the book is in our opinion a very creditable performance. We have seen many a worse come from Germany itself.

Essais de philosophie générale. Cours de philosophie. Par *Charles Dunan*, Professeur de philosophie au Collège Stanislas, Docteur ès lettres. Paris: Librairie Ch. Delagrave. 1902. Pages, vi, 838. Price, 10 francs.

The aim which the author of this work had in view is to connect by a rational bond the fundamental doctrines of the traditional philosophy, viz., the existence of a personal God, free will with moral responsibility, and the existence of a life other than that which we now live in this sensible world. He has sought to support these doctrines by the established certainties of both empiricism and science. He has shunned the so-called demonstrations of "common sense" and endeavored to supply in their place a systematic groundwork which will satisfy at once the scientific and the philosophical reason. The arrangement of the work is that of the ordinary manuals of "mental science," so called.

Die Kritik des Intellects. Positive Erkenntnistheorie. Von *Gustav Ratzenhofer*. Leipzig: F. A. Brockhaus. 1902. Pages, ix, 166.

With the present critique of the intellect, the exposition of Ratzenhofer's philosophical system, which he terms "Monistic Positivism," finds its virtual conclusion. He warns the reader not to confound his positivism with that of Comte or

Spencer, although both these systems also ostensibly seek to reach the truth by way of positive facts, while actually basing many of their conclusions on opinions and desires. His positivism suppresses everything subjective, and abides only by what is provable, non-contradictory, and verifiable by flawless demonstration. But though the author regards his system as concluded in its philosophical aspect, its empirical development is still subject to the progress of science. It is, therefore, as a view of the world, in its author's opinion imperishable; and it has the additional advantage of being practical, having found its realisation in a system of sociology, already partly expounded by the author in its theoretical phases and now awaiting attack in its practical aspects in a forthcoming volume.

La logique morbide: l'analyse mentale. Par *N. Vaschide* et *Cl. Vurpas*. Préface par Th. Ribot. Paris: F. R. de Rudeval et Cie. 1903. Pages, xxviii, 268. Price, 4 Francs.

In the preface which he has prefixed to this work, M. Ribot briefly reviews the psychological researches which are now encroaching upon the hitherto exclusive domain of logic. Logic, in his view, is subordinate to psychology, or is at most a detached province in which the prevailing questions are studied under a different aspect. Deduction, induction, and even analogy, he contends, do not exhaust all the methods of reasoning. There are other methods, imperfect and mixed, the common product of thought, emotion, and will. These are the real discursive processes which are involved in all religious, moral, political, and æsthetic belief, and the theoretical and practical importance of these cruder forms of reasoning is in no need of demonstration. Possibly, he says, studies on this subject should be called "psychology of reasoning" rather than logic. But however this may be, these studies should be pursued. Moreover, for psychology correct or incorrect reasonings do not exist. Psychology is concerned simply with discursive procedures of the mind. The most manifest sophisms are as much reasonings in the psychological sense as are the reasonings of mathematics.

Now, such a study is the present work of MM. Vaschide and Vurpas, which under the title of *Morbid Logic* is to take up in several volumes the subjects of mental analysis, morbid syllogism, morbid emotion, and morbid intellectual creation. The present volume is concerned exclusively with "mental analysis" so called, and is to serve as an introduction to the volumes to follow. By "mental analysis" the authors understand a sort of "psychological rumination," which dwells upon all the details of the internal life of the subject and on all the happenings of his social and cosmical environment; it is even in its feeblest form the first step toward the abnormal, the first stage in morbid evolution. The healthy normal man suffers himself to live physically and morally without studying himself and without watching himself live, at least any more than is necessary. But the moment the demon of analysis possesses him, it is impossible to say to what lengths it will lead him. Here the pathological cases, which are very variable in scope,

begin, and it is these that MM. Vaschide and Vurpas study under the four heads of "Somatic Introspection," "Mental Introspection," "Delirious Introspection," and "Delirious Philosophising." The tendency to analysis, when it transcends a certain stage, will inevitably, according to the authors, end in mental disintegration.

Is There Religious Liberty in China? By *J. J. M. De Groot.* Separate Reprint from the "Mittheilungen des Seminars für Orientalische Sprachen zu Berlin." Jahrgang V. Abth. I.: Ostasiatische Studien. Berlin: Reichsdruckerei. 1902.

Professor De Groot answers the question in the negative. He quotes the imperial edicts which prohibit the practice of any heretical faith and gives an account of the use made of them against Buddhism and Taoism. Both religions maintain themselves in spite of the hostile attitude of Confucianism which alone is the official form of orthodox faith. The fitfulness of the Chinese government with which it now enforces, now relaxes, the severity of the law changes nothing in the real state of things. Under these conditions Christianity can, of course, be maintained only by the protection of the foreign powers.

L'homme de génie. Par *Cesare Lombroso.* Traduit sur la sixième édition italienne par *Fr. Colonna D'Istria*, Agrégé de Philosophie et M. Calderini. Avec 15 planches hors texte. Paris: Schleicher Frères, 15, Rue de Saints-Pères. Turin: Fratelli Bocca. 1903. Pages, xxvi, 916. Price, 12 francs.

The success of this very interesting and now famous work could not be better attested than by the appearance of the numerous editions of it in many languages. The present third French edition has been translated from the sixth Italian edition, and contains fifteen plates, among which we may note the comparison of the brains of geniuses and workingmen, the handwriting of geniuses, paranoic art and furniture, and portraits of men and women of genius.

Studien zur Werttheorie. Von *Robert Eisler.* Leipzig: Verlag von Duncker & Humblot. 1902. Pages, xii, 112. Price, 3 Marks.

Mr. Robert Eisler published last year a group of original and systematic *Studies on the Theory of Values.* He was originally led to his investigations by inquiries in the history and philosophy of art, but was afterwards impelled to undertake a methodological and epistemological study of the theory of the judgments of values generally, entirely apart from their æsthetic applications. The study of values has taken independent form of late, and has given rise to wide-spread discussions, among which those of Mr. Eisler will be accounted not the least considerable. He has dedicated in a pleasing and original manner the three divisions of

his book to Mach, Höfler, and Gurlitt, authors whose thoughts in some way formed the suggestion or occasion for his remarks.

ERKENNTNISTHEORIE UND PSYCHOLOGIE DES ERKENNENS. Von *Dr. Broder Christiansen*. Hanau: Verlag von Clauss & Feddersen. 1902. Pages, iv, 48. Price, 1 M. 50.

The author attempts in this little pamphlet to lay down the lines of demarkation between theory of knowledge and psychology of knowledge. These sciences are concerned with the same object, but, owing to the historical situation which now leans heavily toward psychology, epistemology has emerged from all conflicts with less than its due share of glory. The author expresses his indebtedness to the following philosophers: Descartes, Kant, Fichte, Münsterberg, Rickert, and Windelband.

NOTES.

Professor Gunkel traces the ideal of a Christ, which was superadded to the historical Jesus by the early Christians, to Babylonian sources, and in doing so discovers a number of mythological traits, among which the most remarkable ones are Christ's sojourn in Hell for three days and a half and his resurrection, bringing with him some of the denizens of the pit. In speaking of the three and a half days frequently mentioned in Apocalyptic literature, Professor Gunkel calls attention to the fact that it is a figure "derived from the life of the sun-god," being "the time during which winter prevails." But I venture to suggest that it is simply the figure denoting any cycle. Sometimes it is also employed in a mystical way of addition as $1+2+\frac{1}{2}$, but at any rate it always signifies a cycle, and obviously is nothing but the old number π, the Babylonian mode of approximating the relation between diameter and circumference which was employed for the calculation of the circumference of the circle, accordingly also for cycles.

Dr. Paul Schwartzkopff publishes in the *Archiv für systematische Philosophie* an essay in which he proposes to replace *metaphysics* by *emphysics*. Starting from the Kantian position, he protests against the proposition that the thing-in-itself is unknowable, and thinks that the reaction which set in after Kant has the significance of being the expression of a deep dissatisfaction with the situation, which blocks the road to metaphysical knowledge. While clinging to Monotheism, he considers that there is truth in Pantheism, and claims that Vedantism contains a deeper truth than Kantism. He objects to the idea that there is a world behind a world, but insists on the proposition so strongly emphasised by Goethe, that there

is a world within, and this is the key to metaphysics which for that reason had better be called *emphysics*.

The fifth session of the Harvard Summer School of Theology will be held in Cambridge, Mass., from July 7 to July 23 of this year. The object of the school is "to provide a place where clergymen and students of theology may gather for the study of subjects which have intrinsic and current theological interest, and where they may feel the inspiration which comes from direct contact with the best and most recent results of modern scholarship." The subject for the present session is "Principles of Education in the Work of the Church." The libraries and other collections of Harvard University, including the Semitic Museum, will be open to students of the Summer School. Letters of inquiry should be addressed to the Rev. Robert S. Morison, Divinity Library, Cambridge, Mass.

VOL. XIII. JULY, 1903. NO. 4.

THE MONIST

NETER.

THE EGYPTIAN WORD FOR GOD BY E. A. WALLIS BUDGE.

THE common word given by the Egyptians to God, and god, and spirits of every kind, and being of all sorts, and kinds, and forms, which were supposed to possess any superhuman, supernatural power, was NETER, , and the hieroglyph which is used both as the determinative of this word and also as an ideograph is . Thus we have or , "god," and , or , or , or , "gods"; the plural is sometimes written out in full, for instance, . The common word for "goddess" is NETERT, which is either written , or , or ; sometimes the determinative of the word is a woman, , and at others a serpent, e. g., . The plural is NETERIT, .

We have now to consider what object is supposed to be represented by , and what the word NETER means.

In Bunsen's *Egypt's Place* (I., Nos. 556, 557, 623) the late Dr. Birch described as a hatchet; in 1872 Dr. Brugsch placed[1] among "objects tranchants armes" in his classified list of hieroglyphic characters; thus it is clear that the two greatest masters of Egyptology considered to be either a weapon or a cutting tool, and, in fact, assumed that the hieroglyphic represented an axe-head let into and fastened in a long wooden handle. In the texts wherein the hieroglyphics are colored it is tolerably clear that the axe-head was fastened to its handle by means of thongs of leather. The

[1] *Index des hiéroglyphs phonétiques*, No. 394.

earliest axe-heads were made of stone, or flint or chert, and later of metal, and it is certain that when copper, bronze, and iron took the place of stone or flint, the method by which the head was fastened to the handle was considerably modified. Recently an attempt has been made to show that the axe, , resembled in outline "a roll of yellow cloth, the lower part bound or laced over, the upper part appearing as a flap at the top probably for unwinding. It is possible, indeed, that the present object represents a fetish, e. g., a bone carefully wound round with cloth and not the cloth alone."[1] But it need hardly be said that no evidence for the correctness of these views is forthcoming. Whether the hieroglyphic was copied from something which was a roll of cloth or a fetish matters little, for the only rational determination of the character is that which has already been made by Drs. Birch and Brugsch, and the object which is represented by is an axe and nothing else.

Mr. Legge has collected[2] a number of examples of the presence of the axe as an emblem of divinity on the megaliths of Brittany and in the prehistoric remains of the funeral caves of the Marne, of Scandinavia, and of America, and, what is very much to the point, he refers to an agate cylinder which was published by the late Adrian de Longpérier, wherein is a representation of a priest in Chaldæan garb offering sacrifice to an axe standing upright upon an altar. Mr. Legge points out "that the axe appears on these monuments not as the representation of an object in daily use, but for religious or magical purposes," and goes on to say that this is proved by "the fact that it is often found as a pendant and of such materials as gold, lead, and even amber; while that it is often represented with the peculiar fastenings of the earlier flint weapon shows that its symbolic use "goes back to the neolithic and perhaps the palæolithic age."

Mr. Legge is undoubtedly correct in thinking that the use of the stone axe precedes that of the flint arrow-head or flint knife, and many facts could be adduced in support of this view. The

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[1] Griffith, *Hieroglyphs*, p. 46. [2] *Proc. Soc. Bibl. Arch.*, 1899, p. 310.

stone tied to the end of a stick formed an effective club, which was probably the earliest weapon known to the predynastic Egyptians, and subsequently man found that this weapon could be made more effective still by making the stone flat and by rubbing down one end of it to form a cutting edge. The earliest axe-head had a cutting edge at each end, and was tied by leather thongs to the end of a stick by the middle, thus becoming a double axe; examples of such a weapon appear to be given on the green slate object of the archaic period which is preserved in the British Museum[1] (Nos. 20,790, 20,792), where, however, the axe-heads appear to be fixed in forked wooden handles. In its next form the axe-head has only one cutting edge, and the back of it is shaped for fastening to a handle by means of leather thongs.

When we consider the importance that the axe, whether as a weapon or tool, was to primitive man, we need not wonder that it became to him first the symbol of physical force, or strength, and then of divinity or dominion. By means of the axe the predynastic Egyptians cut down trees and slaughtered animals, in other words, the weapon was mightier than the spirits or gods who inhabited the trees and the animals, and as such became to them at a very early period an object of reverence and devotion. But besides this the axe must have been used in sacrificial ceremonies, wherein it would necessarily acquire great importance, and would easily pass into the symbol of the ceremonies themselves.

The shape of the axe-head as given by the common hieroglyphic suggests that the head was made of metal when the Egyptians first began to use the character as the symbol of divinity, and it is clear that this change in the material of which the axe-head was made would make the weapon more effective than ever.

Taking for granted, then, that the hieroglyphic represents an axe, we may be sure that it was used as a symbol of power and divinity by the predynastic Egyptians long before the period when they were able to write, but we have no means of knowing what they called the character or the axe before that period. In dynastic

[1] See my *Egypt under the Great Pyramid Builders*, p. 10, where it is figured and described.

times they certainly called it NETER as we have seen, but another difficulty presents itself to us when we try to find a word that will express the meaning which they attached to the word; it is most important to obtain some idea of this meaning, for at the base of it lies, no doubt, the Egyptian conception of divinity or God.

The word NETER has been discussed by many Egyptologists, but their conclusions as to its signification are not identical.

M. Pierret thought in 1879 that the true meaning of the word is "renewal, because in the mythological conception, the god assures himself everlasting youth by the renewal of himself in engendering himself perpetually."[1]

In the same year, in one of the Hibbert Lectures, Renouf declared that he was "able to affirm with certainty that in this particular case we can accurately determine the primitive notion attached to the word," i. e., to NUTAR (NETER). According to him, "none of the explanations hitherto given of it can be considered satisfactory," but he thought that the explanation which he was about to propose would be generally accepted by scholars," because it was "arrived at as the result of a special study of all the published passages in which "the word occurs."[2]

Closely allied to NUTAR (NETER) is another word NUTRA (NETRA), and the meaning of both was said by Renouf to be found in the Coptic ⲛⲟⲩⲧⲉ or ⲛⲟⲩϯ, which, as we may see from the passages quoted by Tatham in his *Lexicon* (p. 310), is rendered by the Greek words *ἰσχὺς*, *παράκλησις*, and *παρακαλεῖν*. The primary meaning of the word ⲛⲟⲩϯ appears to be "strong," and having assumed that NETER was equivalent in meaning to this word, Renouf stated boldly that NETER signified "mighty," "might," "strong," and argued that it meant Power, "which is also the meaning of the Hebrew El."

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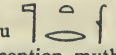
[1] "Le mot par lequel ou rendait l'idée de Dieu  *nuter*, signifie au propre, 'renouvellement,' parce que dans la conception mythologique, le dieu s'assure une éternelle jeunesse par le renouvellement de lui-même, en s'engendrant lui-même perpetuellement." *Essai sur la Mythologie Égyptienne*, Paris, 1879, page 8.

[2] *Religion of Ancient Egypt*, p. 93.

We may note in passing that the exact meaning of "El," the Hebrew name for God, is unknown, and that the word itself is probably the name of an ancient Semitic deity.

The passages which were quoted to prove that NETER meant "strong, strength, power," and the like could, as M. Maspero has said[1], be explained differently. M. Maspero combats rightly the attempt to make "strong" the meaning of NETER (masc.), or NETERIT (fem.), in these words: "In the expressions 'a town *neterit*,' 'an arm *neteri*,'....is it certain that 'a strong city,' 'a strong arm,' gives us the primitive sense of *neter?* When among ourselves one says 'divine music,' 'a piece of divine poetry,' 'the divine taste of a peach,' 'the divine beauty of a woman' [the word] divine is a hyperbole, but it would be a mistake to declare that it originally meant 'exquisite' because in the phrases which I have imagined one could apply it as 'exquisite music,' 'a piece of exquisite poetry,' 'the exquisite taste of a peach,' 'the exquisite beauty of a woman.' Similarly in Egyptian 'a town *neterit*' is a 'divine town'; 'an arm *neteri*' is 'a divine arm,' and *neteri* is employed metaphorically in Egyptian as is [the word] 'divine' in French, without its being any more necessary to attribute to [the word] *neteri* the primitive meaning of 'strong,' than it is to attribute to [the word] 'divine' the primitive meaning of 'exquisite.' The meaning 'strong' of *neteri*, if it exists, is a derived and not an original meaning."[2]

The view taken about the meaning of *neter* by the late Dr. Brugsch was entirely different, for he thought that the fundamental meaning of the word was "the operative power which created and produced things by periodical recurrence, and gave them new life and restored to them the freshness of youth."

"Die thätige Kraft, welche in periodischer Wiederkehr die Dinge erzeugt und erschafft, ihnen neues Leben verleiht und die Jugendfrische zurückgiebt."[3]

The first part of the work from which these words are quoted appeared in 1885, but that Dr. Brugsch held much the same views six years later is evident from the following extract from his volume

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[1] *Études de Mythologie et d'Archéologie Égyptiennes*, tom. ii., p. 215.

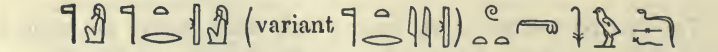
[2] Maspero, *op. cit.*, p. 215. [3] *Religion und Mythologie*, p. 93.

entitled *Die Aegyptologie* (p. 166), which appeared in 1891. Referring to Renouf's contention that NETER has a meaning equivalent to the Greek δύναμις, he says:

"Es liegt auf der Hand, dass der Gottesname im Sinne von Starker, Mächtiger, vieles für sich hat, um so mehr als selbst leblose Gegenstände, wie z. B. ein Baustein, adjektivisch als *nutri*, d. h. stark, mächtig, nicht selten bezeichnet werden. Aber so vieles diese Erklärung für sich zu haben scheint, so wenig stimmt sie zu der Thatsache, dass in den Texten aus der besten Zeit (XVIII. Dynastie) das Wort *nutr* als ein Synonym für die Vorstellung der Verjüngung oder Erneuerung auftritt. Er diente zum Ausdruck der periodisch wiederkehrenden Jugendfrische nach Alter und Tod, so dass selbst dem Menschen in den ältesten Sarginschriften zugerufen wird, er sei fortan in einen Gott, d. h. in ein Wesen mit jugendlicher Frische, umgewandelt. Ich lasse es dahingestellt sein, nach welcher Richtung hin die aufgeworfene Streitfrage zu Gunsten der einen oder der anderen Auffassung entschieden werden wird; hier sei nur betont, dass das Wort *nutr*, *nute*, den eigentlichen Gottesbegriff der alten Aegypter in sich schliesst und daher einer ganz besonderen Aufmerksamkeit werth ist."

In this passage Dr. Brugsch substantially agrees with Pierret's views quoted above, but he appears to have withdrawn from the position which he took up in his *Religion und Mythologie*, wherein he asserted that the essential meaning of NETER was identical with that of the Greek φύσις and the Latin "natura."[1] It need hardly be said that there are no good grounds for such an assertion, and it is difficult to see how the eminent Egyptologist could attempt to compare the conceptions of a savage or half-savage indigenous African people with those of such cultured nations as the Greeks and the Romans.

The solution of the difficulty of finding a meaning for NETER is not brought any nearer when we consider the views of such distinguished Egyptologists as E. de Rougé, Lieblein, and Maspero. The first of these in commenting on the passage



which he translates "Dieu devenant dieu (en) s'engendrant lui-même," says in his excellent *Chrestomathie Égyptienne* (iii., p. 24):

[1] "Der Inbegriff dieses Wortes deckt sich daher vollständig mit der ursprünglichen Bedeutung des griechischen *physis* und des lateinischen *natura*" (p. 93).

"One knows not exactly the meaning of the verb *nuter*, which forms the radical of the word *nuter*, 'god.' It is an idea analogous to 'to become,' or 'renew oneself,' for *nuteri* is applied to the resuscitated soul which clothes itself in its immortal form."

Thus we find that one of the greatest Egyptologists thinks that the exact meaning of NETER is unknown, but he suggests that it may have a signification not unlike that proposed by Pierret. Professor Lieblein goes a step further than E. de Rougé, for he is of opinion that it is impossible to show the first origin of the idea of God among any people hitherto known historically.

"When we, for instance, take the Indo-Europeans, what do we find there? The Sanskrit word *deva* is identical with the Latin *deus*, and the northern *tivi tivar*; as now the word in Latin and northern language signifies God it must also in Sanskrit from the beginning have had the same signification. That is to say, the Arians, or Indo-Europeans, must have combined the idea of God with this word, as early as when they still lived together in their original home. Because, if the word in their prehistoric home had had another more primitive signification, the wonder would have happened, that the word had accidentally gone through the same development of signification with all these people after their separation. As this is quite improbable, the word must have had the signification of God in the original Indo-European language. One could go even farther and presume that, in this language also, it was a word derived from others, and consequently originated from a still earlier prehistoric language. All things considered it is possible, even probable, that the idea of God has developed itself in an earlier period of languages than the Indo-European. The future will perhaps be able to supply evidence for this. The science of languages has been able partly to reconstruct an Indo-European prehistoric language. It might be able also to reconstruct a prehistoric Semitic, and a prehistoric Hamitic, and of these three prehistoric languages, whose original connection it not only guesses, but even commences to prove gradually, it will, we trust in time, be able to extract a still earlier prehistoric language, which according to analogy might be called Noahitic. When we have come so far, we shall most likely in this prehistoric language, also find words expressing the idea of God. But it is even possible that the idea of God has not come into existence in this prehistoric language either. It may be the first dawning of the idea, and the word God should be ascribed to still earlier languages, to layers of languages so deeply buried that it will be impossible even to excavate them. Between the time of inhabiting caves in the quaternian period, and the historical kingdoms, there is such a long space of time, that it is difficult to entertain the idea, that it was quite devoid of any conception of divinity, so that this should first have sprung up in the historical time. In any case we shall not be able to prove

historically where and when the question first arose, who are the superhuman powers whose activity we see daily in nature and in human life. Although the Egyptians are the earliest civilised people known in history, and just therefore especially important for the science of religion, yet it is even there impossible to point out the origin of the conception of the deity. The oldest monuments of Egypt bring before us the gods of nature chiefly, and among these especially the sun. They mention, however, already early (in the Fourth and Fifth Dynasties) now and then the great power, or the great God, it being uncertain whether this refers to the sun, or another god of nature, or if it was a general appellation of the vague idea of a supernatural power, possibly inherited by the Egyptians. It is probably this great God indicated on the monuments, from the Fourth Dynasty, and later on, who has given occasion to the false belief that the oldest religion of the Egyptians was pure monotheism. But firstly, it must be observed, that he is not mentioned alone but alongside of the other gods, secondly, that he is merely called 'The great God,' being otherwise without distinguishing appellations, and a God of whom nothing else is mentioned, has, so to speak, to use Hegel's language, merely an abstract existence, that by closer examination dissolves into nothing."

It is necessary to quote Professor Lieblein's opinion at length because he was one of the first to discuss the earliest idea of God in connection with its alleged similarity to that evolved by Aryan nations; if, however, he were to rewrite the passage given above in the light of modern research he would, we think, modify many of his conclusions. For our present purpose it is sufficient to note that he believes it is impossible to point out the origin of the conception of the deity among the Egyptians.

The last opinion which we need quote is that of M. Maspero, who not only says boldly that if the word NETER or NETRI really has the meaning of "strong" it is a derived and not an original meaning, and he prefers to declare that the word is so old that its earliest signification is unknown. In other words, it has the meaning of god, but it teaches us nothing as to the primitive value of this word. We must be careful, he says, not to let it suggest the modern religious or philosophical definitions of god which are current to-day, for an Egyptian god is a being who is born and dies, like man, and is finite, imperfect, and corporeal, and is endowed with passions, and virtues, and vices.[2] This statement is, of course,

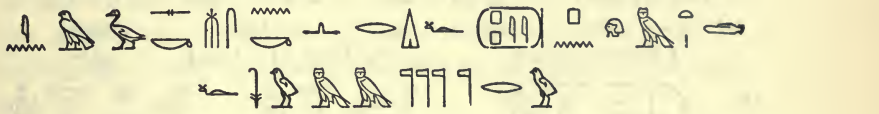
[1] *Egyptian Religion*, by J. Lieblein, Leipzig, 1884.

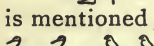
[2] *La Mythologie Égyptienne* p. 216 (*Études de Mythologie*, tom. ii., p. 215).

true as regards the gods of the Egyptians at several periods of their history, but it must be distinctly understood, and it cannot be too plainly stated, that side by side with such conception there existed among the educated Egyptians at least ideas of monotheism which are not far removed from those of modern nations.

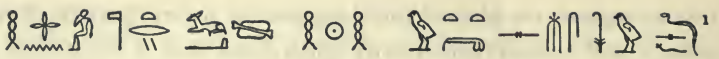
From what has been said above we see that scholars take the view that the word NETER may mean "renewal," or "strength," or "strong," or "to become," or some idea which suggests "renewal," and that others think its original meaning is not only unknown, but that it is impossible to find it out. But although we may not be able to discover the exact meaning which the word had in pre-dynastic times, we may gain some idea of the meaning which was attached to it in the dynastic period by an examination of a few passages from the hymns and Chapters which are found in the various versions of the *Book of the Dead.* In the text of Pepi I. (line 191) we have the words:

"Behold thy son Horus, to whom thou hast given birth. He hath not placed this Pepi at the head of the dead, but he hath set him among the gods *neteru*,"



Now here *neteru* must be an adjective, and we are clearly intended to understand that the gods referred to are those which have the attribute of *neteru*; since the "gods *neteru*," , are mentioned in opposition to "the dead" it seems as if we are to regard the gods as "living," i. e., to possess the quality of life. In the text of the same king (line 419) a *bak neter*, , i. e., a hawk having the quality of *neter*, is mentioned; and in the text of Unas (l. 569) we read of *baui netrui*,  , or the two souls which possess the quality of *neter*. These examples belong to the Fifth and Sixth Dynasties.

Passing to later dynasties, i. e., the Eighteenth and Nineteenth, etc., we find the following examples of the use of the words *neter* and *netri*.

1.  [1]

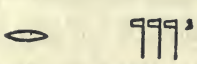
ḥun *netri* *aā* *ḥeḥ* *utet* *se-mes* *su tchesef*

Boy *netri*, heir of eternity, begetting and giving birth to himself.

2.

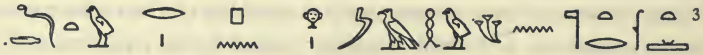
ta-ȧ *tu* *em* *ȧb-ȧ* *ȧti* *bakai* *netri*

I am devoted in my heart without feigning, O thou *netri*

 [2]

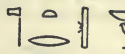
er *neteru*

more than the gods.

3.  [3]

tcheṭ - tu *re* *pen* *ḥer* *maḥu* *en* *netrȧt*

Shall be said this chapter over a crown of *netrat.*

4.  [4]

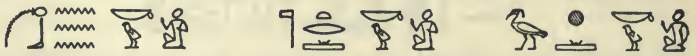
neter - kuȧ

I have become *neter.*

5. [5]

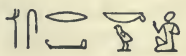
ȧu - ȧ *khā - kuȧ* *em* *bȧk* *netri*

I have risen up in the form of a hawk *netri.*

6. 

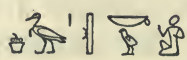
ab - kuȧ *neter - kuȧ* *khu - kuȧ*

I have become pure, I have become *neter*, I have become a spirit (*khu*),



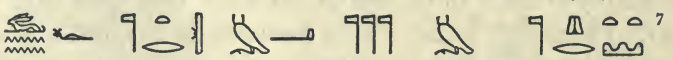
user - kuȧ

I have become strong,

 [6]

ba - kuȧ

I have become a soul (*ba*).

7.  [7]

unen-f *neter* *mā* *neteru* *em* *Neter-khertet*

this being *neter* with the gods in the Neter-khertet.

(or, he shall be)

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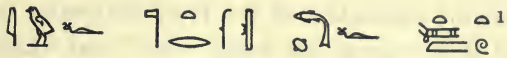
[1] See my *Chapters of Coming Forth by Day*, Text, p. 11, l. 10.

[2] *Ibid.*, p. 43, l. 4. [3] *Ibid.*, p. 80, l. 10. [4] *Ibid.*, p. 154, l. 6.

[5] *Ibid.*, p. 168, l. 3. [6] *Ibid* . p. 174, l. 15. [7] *Ibid.*, p. 417, l. 12.

8. 

ȧuf *netrȧ* *khat-f* *temtu*
the shall *netra* his body all.

9.

netri *u* *ba* - *k* *em* *per* *Sebut*
They make *neter* thy soul in the house of Sebut.

10.

netri - *f* *ba* - *k* *mȧ* *neteru*
He makes *neter* thy soul like the gods.

11.

neter *netri* *kheper tchesef* *paut*
God *netri*, self-produced, primeval matter.

Now, in the above examples it is easy to see that although the words "strong" or "strength," when applied to translate *neter* or *netri*, give a tolerably suitable sense in some of them, it is quite out of place in others, e. g., in No. 6, where the deceased is made to say that he has acquired the quality of *neter*, and a spirit, and a soul, and is, moreover, strong; the word rendered "strong" in this passage is *user*, and it expresses an entirely different idea from *neter*.

From the fact that *neter* is mentioned in No. 1 in connection with eternal existence, and self-begetting, and self-production, and in No. 11 with self-production and primeval matter, it is almost impossible not to think that the word has a meaning which is closely allied to the ideas of "self-existence," and the power to "renew life indefinitely," and "self-production."

In other words, *neter* appears to mean a being who has the power to generate life, and to maintain it when generated. It is useless to attempt to explain the word by Coptic etymologies, for it has passed over directly into the Coptic language under the forms *nouti*, and *noute*, the last consonant, *r*, having disappeared through

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[1] See my *Chapters of Coming Forth by Day*, Text, p. 419, l. 7.
[2] *Ibid.*, p. 509, l. 13. [3] *Ibid.*, p. 511, l. 13. [4] *Ibid.*, p. 49, l. 1.

phonetic decay, and the translators of the Holy Scriptures from that language used it to express the words "God" and "Lord." Meanwhile, until new light is thrown upon the subject by the discovery of inscriptions older than any which we now have, we must be content to accept the approximate meaning of *neter* suggested above.

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THE FOUNDATIONS OF GEOMETRY.

[CONCLUDED.]

DIFFERENT GEOMETRICAL SYSTEMS.

STRAIGHTNESS, flatness, and rectangularity are qualities which cannot (like numbers) be determined in purely quantitative terms. A right angle is not an arbitrary amount of ninety degrees, but the quarter of a circle, and the nature of angles and degrees is not derivable either from arithmetic or from pure reason. A plane is not zero, but a zero of curvature in a boundary between two solids. There is a qualitative element which cannot be expressed in numbers alone; and this qualitative element is determined, as Kant would express it by *Anschauung*, or as we prefer to say by pure motility, viz., it belongs to the domain of the *a priori* of doing.

Our method of creating by construction the straight line, the plane, and the right angle, does not exclude the possibility of other methods of space-measurement, the standards of which would not be even boundaries, such as straight lines, but lines possessed of either a positive curvature like the sphere or a negative curvature rendering their surface pseudo-spherical.

Spheres are well known and do not stand in need of description. Their curvature which is positive is determined by the reciprocal of their radius.

Pseudo-spheres are surfaces of negative curvature, and pseudo-spherical surfaces are saddle-shaped. Only limited pieces can be connectedly represented, and we reproduce from Helmholtz, *loc. cit.*, p. 42, two instances. If arc *ab* in figure 1 revolves round an

axis AB, it will describe a concave-convex surface like that of the inside of a wedding-ring; and in the same way, if either of the curves of figure 2 revolve round their axis of symmetry, it will describe one half of a pseudospherical surface resembling the shape of a morning-glory whose tapering stem is infinitely prolonged. Helmholtz compares the former to an anchor-ring, the latter to a champagne glass.

The sum of the angles of triangles on spheres always exceeds 180°, and the larger the sphere the more will their triangles resemble the triangle in the plane. On the other hand, the sum of the angles of triangles on the pseudosphere will always be somewhat less than 180°. If we define the right angle as the fourth part

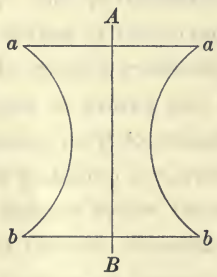


Fig. 1.

Fig. 2.

of a whole circuit, it will be seen that analogously the right angle in the plane differs from the right angles on the sphere as well as the pseudosphere.

We may add that while in spherical space several shortest lines are possible, in pseudospherical space we can draw one shortest line only. Both surfaces, however, are homogeneous (i. e., figures can be moved in it without suffering a change in dimensions), but the parallel lines which do not meet are impossible in either.

We may further construct surfaces in which changes of place involve either expansion or contraction, but it is obvious that they would be less serviceable as systems of space-measurement the more irregular they grow.

DIMENSIONS AS CO-ORDINATES.

But why is space tri-dimensional? Why is it not four or five or *n*-dimensional?

Let us ask first what "dimension" means.

Does dimension mean direction? Obviously not, for we have seen that the possibilities of direction in space are infinite.

Dimension is only a popular term for coördinate. In space there are no dimensions laid down, but in a space of infinite directions three coördinates are needed to determine from a given point of reference the position of any other point.

We have halved space and produced a plane, P_1; we have halved the plane P_1 and produced the straight line AB on the plane. We have halved the straight line, the even boundary between the two half planes, by the perpendicular CD, in the point O, thus producing right angles on the straight line AB, represented in the cross-creases of the twice folded sheet of paper.

The point is simply a place, or as the mathematical term is, a *locus*, viz., a spot in space the site of which is determined by the crossing of two lines. It has no extension, and here our method of producing even boundaries by halving comes to a natural end. So far our products are the plane, the straight line, the point, and as an incidental but valuable by-product, the right angle.

We may now venture on a synthesis of our materials. We lay two planes, P_2 and P_3, through the two creases at right angles on the original plane P_1, represented by the sheet of paper, and it becomes apparent that the two new planes P_2 and P_3 will intersect at O, producing a line EF common to both planes P_2 and P_3, and they will bear the same relation to each as each one does to the original plane P_1, that is to say: the whole system is congruent with itself. If we make the planes change places, P_1 may as well take the place of P_2 and P_2 of P_3 and P_3 of P_2 or P_1 of P_3, etc., or *vice versa*, and all the internal relations would remain absolutely the same. Accordingly we have here in this system of the three planes at right angles (the result of repeated halving), a composition

of even boundaries which, as the simplest and least complicated construction of its kind, recommends itself for a standard of measurement of the whole spread of motility.

TRIDIMENSIONALITY.

The most significant feature of our construction consists in this, that we thereby produce a convenient system of reference for determining *all* points in coördinates of straight lines standing at right angles to the three planes.

If we start from the ready conception of objective space (the juxtaposition of things or of loci) we can produce the same result of three planes at right angles by a process of halving. We cut space in two equal halves by the horizontal plane P_1. We repeat the cutting so as to let the two halves of the first cut in their angular relation to the new cut (in P_2) be congruent with each other, a procedure which is possible only if we make use of the even boundary concept with which we have become acquainted. Accordingly, the second cut should stand at right angles on the first cut. The two planes P_1 and P_2 have one line in common, EF, and any plane placed at right angles to EF (in the point O) will again satisfy the demand of dividing space, including the two planes P_1 and P_2, into two congruent halves. The two new lines, produced by the cut of the third plane P_3 through the two former planes P_1 and P_2, stand both at right angles to EF. Should we continue our method of cutting space at right angles in O on either of these lines, we would produce a plane coincident with P_1, which is to say, that the possibilities of the system are exhausted.

This implies that in any system of pure space *three coördinates are sufficient* for the determination of any place from a given reference point.

The number three is a concept of boundary as much as the straight line. Under specially complicated conditions we might need ten coördinates to calculate the place of a point, but in empty space the number three, the lowest number that is really and truly a number, is sufficient. If space is to be empty space constructed as anyness for the purpose of determining juxtaposition, three co-

ordinates are sufficient, because our system of reference consists of three planes, and we have seen above that there is no possibility of introducing a fourth plane without destroying its character of being congruent with itself, which imparts to it the simplicity that renders it available for a standard of measurement.

Three is a peculiar number which is of great significance. It is the first real number, being the simplest multiplex. One and two are not yet numbers in the full sense of the word. One is the unit, two is a couple or a pair, but three is the smallest amount of a genuine plurality. Savages who can distinguish only between one and two have not yet evolved the notion of number; and the transition to the next higher stage involving the knowledge of "three" passes through a mental condition in which there exists only the notion one, two, and plurality of any kind. When the idea of three is once definitely recognised, the naming of all other numbers can follow in rapid succession.

Certainly it is no accident that in order to construct the simplest figure which is a real figure, at least three lines are needed. The importance of the triangle, which becomes most prominent in trigonometry, is due to its being the simplest possible figure which accordingly possesses the intrinsic worth of economy.

The number three plays also a significant part in logic, and in the branches of the applied sciences, and thus we need not be astonished at finding the three held in religious reverence, for the doctrine of the Trinity has its basis in the constitution of the universe and can be fully justified by the laws of pure form.

THE APPARENT ARBITRARINESS OF THE A PRIORI.

Since Riemann has generalised the conception of space, the tridimensionality of space seems very arbitrary.

Why are three coördinates sufficient for pure space determinations? The obvious answer is, Because we have three planes in our construction of space-boundaries. We might as well ask, why do the three planes cut the entire space into 8 equal parts; the simple answer is that we have halved space three times, and $2^3 = 8$.

The reason is practically the same as the simpler one, why have we two halves if we divide an apple into two equal parts.

These answers are simple enough, but there is another question which here seems in order: Why not continue the method of halving? And there is no other answer than that it is impossible. The two superadded planes P_2 and P_3 both standing at right angles to the original plane, necessarily halve each other, and thus the four right angles of each plane P_2 and P_3 on the centre of intersection, form a complete plane for the same reason that four quarters are one whole. We have in each case four quarters, and $\frac{4}{4}=1$.

Purely logical arguments (i. e., all modes of reasoning that are rigorously *a priori*, the *a priori* of abstract being) break down and we must resort to the methods of the *a priori* of doing. We cannot understand or grant the argument without admitting the conception of space, previously created by a spread of pure motion. Kant would say that we need here the data of *reine Anschauung*, and Kant's *reine Anschauung* is a product of our motility. As soon as we admit that there is an *a priori* of doing (of free motility) and that our conception of pure space and time (Kant's *reine Anschauung*) is its product, we understand that our mathematical conceptions cannot be derived from pure logic alone but must finally depend upon our motility, viz., the function that begets our notion of space.

If we divide an apple by a vertical cut through its center, we have two halves. If we cut it again by a horizontal cut through its center, we have four quarters. If we cut it again with a cut that is at right angles to both prior cuts, we have eight eighths. It is obviously impossible to insert among these three cuts a fourth cut that would stand at right angles to these others. The fourth cut through the center, if we needs would have to make it, will fall into one of the prior cuts and be a mere repetition of it, producing no result; or if we made it slanting, it would not cut all eight parts but only four of them; it would not produce sixteen equal parts, but twelve unequal parts, viz., eight sixteenths plus four quarters.

If we do not resort to a contemplation of the scope of motion,

if we neglect to represent in our imagination the figure of the three planes and rely on pure reason alone (i. e., the rigid *a priori*), we have no means of refuting the assumption that we ought to be able to continue halving the planes by other planes at right angles. Yet is the proposition as inconsistent as to expect that there should be regular pentagons, or hexagons, or triangles, the angles of which are all ninety degrees.

From the standpoint of pure reason alone we cannot disprove the incompatibility of the idea of a rectangular pentagon. If we insist on constructing by hook or crook a rectangular pentagon, we will succeed, but we must break away from the straight line or the plane. A rectangular pentagon is not absolutely impossible; it is absolutely impossible in the plane; and if we produce one, it will be twisted.

Such was the result of Lobatchevski's and Bolyai's construction of a system of geometry in which the theorem of parallels does not hold. Their geometries cease to be even; they are no longer Euclidean and render the even boundary conceptions unavailable as standards of measurement. That is all.

If by logic we understand consistency, and if anything that is self-contradictory and incompatible with its own nature be called illogical, we would say that it is not the logic of pure reason that renders certain things impossible in our geometric constructions, but the logic of our scope of motion. The latter introduces a factor which determines the nature of geometry, and if this factor is neglected or misunderstood, the fundamental notions of geometry must appear arbitrary.

DEFINITENESS OF CONSTRUCTION.

The problems which puzzle some of the metaphysicians of geometry seem to have one common foundation, which is the definiteness of geometrical construction. Geometry starts from empty nothingness, and we are confronted with rigid conditions which it does not lie in our power to change. We make a construction, and the result is something new, perhaps something which we have

not intended, something at which we are surprised. The synthesis is a child of our own doing, yet there is an objective element in it over which we have no command, and this objective element is rigid, uncompromising, an irrefragable necessity, a stubborn fact, immovable, inflexible, immutable. What is it?

Our metageometricians overlook the fact that their nothingness is not an absolute nothing, but only an absence of concreteness. If they make definite constructions, they must (if they only remain consistent) expect definite results. This definiteness is the logic that dominates their operations. Sometimes the results seem arbitrary, but they never are; for they are necessary, and all questions *why?* can elicit only answers that turn in a circle and are mere tautologies.

Why, we may ask, do two straight lines, if they intersect, produce four angles? Perhaps we did not mean to construct angles, but here we have them in spite of ourselves.

And why is the sum of these four angles equal to 360°? Why, if two are acute, will the other two be found to be obtuse? Why, if one angle be a right angle, will all four be right angles? Why will the sum of any two adjacent angles be equal to two right angles? etc. Perhaps we should have preferred three angles only, or four acute angles, but we cannot have them, at least not by this construction.

We have seen that the tridimensionality of space is arbitrary only if we judge of it as a notion of pure reason, without taking into consideration the method of its construction as a scope of mobility. Tridimensionality is only one instance of apparent arbitrariness among many others of the same kind.

We cannot construct a figure of two straight lines, and we cannot construct a solid of three even surfaces.

There are only definite forms of polyhedra possible, and the surfaces of every one are definitely determined. To the mind uninitiated into the secrets of mathematics it would seem arbitrary that there are two hexahedra (viz., the cube and the duplicated tetrahedron), while there is no heptahedron. And why can we not

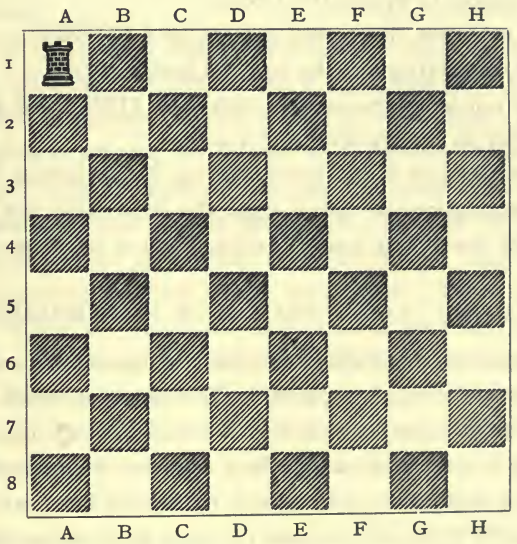
have an octahedron with quadrilateral surfaces? We might as well ask, why is the square not round!

Prof. G. B. Halsted says in the Translator's Appendix to his English edition of Lobatchevsky's *Theory of Parallels*, p. 48:

"But is it not absurd to speak of space as interfering with anything? If you think so, take a knife and a raw potato and try to cut it into a seven-edged solid."

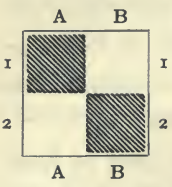
Truly Professor Halsted's contention, that the laws of space interfere with our operations, is true. Yet it is not space that squeezes us, but the laws of construction determine the shape of the figures which we make.

A simple instance that illustrates the way in which space interferes with our plans and movements is the impossible demand on the chess-board to start a rook in one corner (*A* 1) and pass it with the rook motion over all fields once, but only once, and let it end its journey on the opposite corner (*H* 8). Rightly considered



it is not space that interferes with our mode of action, but the law of consistency. The proposition does not contain anything illogical; the words are quite rational and the sentences grammatically correct. Yet is the task impossible, because we cannot turn to the

right and left at once, nor can we be in two places at once, neither can we undo an act once done or for the nonce change the rook into a bishop; but something of that kind would have to be done, if we start from *A* 1 and passing with the rook motion through *A* 2 and *B* 1 over to *B* 2. In other words: Though the demand is not in conflict with the logic of abstract being or the grammar of thinking, it is impossible because it collides with the logic of doing; the logic of moving about, the *a priori* of motility.



The same is true of the squaring of the circle.

We cannot venture on self-contradictory enterprises without being defeated, and if the relation of the circumference to the diameter is an infinite transcendent *series*, being

$$\tfrac{1}{4}\pi = 1 - \tfrac{1}{3} + \tfrac{1}{5} - \tfrac{1}{7} + \tfrac{1}{9} - \tfrac{1}{11} + \tfrac{1}{13} - \tfrac{1}{15} + \tfrac{1}{17} - \tfrac{1}{19} + \tfrac{1}{21} - \tfrac{1}{23} + \cdots$$

we cannot expect to square the circle.

If we compute the series, π becomes 3.14159265...., figures which seem as arbitrary as the most whimsical fancy.

It does not seem less strange that $\epsilon = 2.71828$; and yet it is as little arbitrary as the equation $3 \times 4 = 12$.

The definiteness of our mathematical constructions and arithmetical computations is based upon the inexorable law of determinism, and everything is fixed by the mode of its construction.

ONE SPACE, BUT VARIOUS SYSTEMS OF SPACE-MEASUREMENT.

Riemann has generalised the idea of space and would thus justify us in speaking of "spaces." The common notion of space, which is the traditional one of Euclidean geometers, has been degraded into a mere species of space, one possible instance among many other possibilities. And its very legitimacy has been doubted, for it has come to be looked upon in some quarters as only a popular (not to say vulgar and commonplace) notion, a mere working hypothesis, infested with many arbitrary conditions of which the ideal conception of absolute space should be free. How much more interesting and aristocratic are curved space, the dainty two-

dimensional space, and above all the four-dimensional space with its magic powers!

The new space-conception seems bewildering. Some of these new spaces are constructions that are not concretely representable, but only abstractly thinkable; yet they allow us to indulge in ingenious dreams. Think only of two-dimensional beings, and how limited they are! They can have no conception of a third dimension! Then think of four-dimensional beings; how superior they must be to us poor tridimensional beings! As we can take a figure situated within a circle through the third dimension and put it down again outside the circle without crossing the circumference, so four-dimensional beings could take tridimensional things encased in a box from their hiding-place and put them back on some other spot. They could easily help themselves to all the money in the steel-lined safes of our banks, and they could perform the most difficult obstetrical feats without resorting to the dangerous Cæsarean operation.

Curved space is not less interesting. Just as light may pass through a medium that offers such a resistance as will involve a continuous displacement of the rays, so in curved space the lines of greatest intensity would be subject to a continuous modification. The beings of curved space may be assumed to have no conception of truly straight lines. They must deem it quite natural that if they walk on in the straightest possible manner they will finally but unfailingly come back to the same spot. Their world-space is not as vague and mystical as ours: it is not infinite, hazy at a distance, vague and without end, but definite, well rounded off, and perfect. Presumably their lives have the same advantages moving in boundless circles, while our progression in straight lines hangs between two infinitudes—the past and the future!

All these considerations are very interesting and open new vistas to imaginative speculators and inventors, and we cannot deny that the generalisation of our space-conception has proved helpful by throwing new light upon geometrical problems and widening the horizon of our mathematical knowledge.

Nevertheless after a mature deliberation of Riemann's propo-

sition, I have come to the conclusion that it leads us off in a wrong direction, and in contrast to his conception of space as being one instance among many possibilities, I would insist upon the uniqueness of space. Space is the possibility of motion in all directions, and mathematical space is the ideal construction of our scope of motion in all directions.

The homogeneity of space is due to our abstraction which omits all particularities, and its homaloidality means only that straight lines are possible and will best serve us as standards of measurement.

Curved space, so called, is a more complicated construction of space-measurement to which some additional feature of a particular nature has been admitted, and in which we waive the advantages of even boundaries as means of measurement.

Space, the actual scope of motion, remains different from all systems of space-measurement, be they homaloidal or curved, and should not be subsumed with them under one and the same category.

Riemann's several space-conceptions are not spaces in the proper sense of the word, but systems of space-measurement. It is true that space is a tridimensional manifold, and a plane a two-dimensional manifold, and we can think of other systems of n manifoldness; but for that reason all these different manifolds do not become spaces. Man is a mammal having two prehensiles (his hands); the elephant is a mammal with one prehensile (his trunk); tailless monkeys like the pavian have four; and tailed monkeys have five prehensiles. Is there any logic in extending the denomination man to all these animals, and should we define the elephant as a man with one prehensile, the pavian as a man with four prehensiles and tailed monkeys as men with five prehensiles? Our zoölogists would at once protest and denounce it as an illogical misuse of names.

Space is a manifold, but not every manifold is a space.

Of course every one has a right to define the terms he uses, and obviously my protest simply rejects Riemann's use of a word,

but I claim that his identification of "space" with "manifold" is the source of inextricable confusion.

It is well known that all colors can be reduced to three primary colors, yellow, red, and blue, and thus we can determine any possible tint by three coördinates, and color just as much as mathematical space is a threefold, viz., a system in which three coördinates are needed for the determination of any thing. But because color is a threefold, no one would assume that color is space.

Riemann's manifolds are systems of measurement, and the system of three coördinates on three intersecting planes is an *a priori* or pure formal and ideal construction invented to calculate space. We can invent other more complicated systems of measurement, with curved lines and with more than three or less than three coördinates. We can even employ them for space-measurement, although they are rather awkward and unserviceable; but these systems of measurement are not "spaces" and if they are called so, they are spaces by courtesy only. By a metaphorical extension we allow the idea of system of space-measurement to stand for space itself. It is a brilliant idea and quite as ingenious as the invention of animal fables in which our quadruped fellow-beings are endowed with speech and treated as human beings. But such poetical licences, in which facts are stretched and the meaning of terms is slightly modified, is possible only if instead of the old-fashioned straight rules of logic we grant a slight curvature to our syllogisms.

FICTITIOUS SPACES AND THE APRIORITY OF ALL SYSTEMS OF SPACE-MEASUREMENT.

Mathematical space, so called, is strictly speaking no space at all, but the mental construction of a manifold, being a tridimensional system of space-measurement invented for the determination of actual space.

Neither can a manifold of two dimensions be called a space. It is a mere boundary in space, it is no reality, but a concept, a construction of pure thought.

Further, the manifold of four dimensions is a system of meas-

urement applicable to any reality for the determination of which four coördinates are needed. It is applicable to real space if there is connected with it in addition to the three planes at right angles another condition of a constant nature, such as gravity.

At any rate, we must deny the applicability of a system of four dimensions to empty space void of any such particularity. Unless Riemann can show that sixteen cubes (neither more nor fewer) could be so placed together that they have one point of common contact, I must regard the idea of four-dimensional space as chimerical, the word space being used in the common acceptance of the term as juxtaposition or as the scope of motion. So long as four quarters make one whole, and four right angles make one entire circumference, and so long as the contents of a sphere which covers the entire scope of motion round its center equals $\frac{4}{3}\pi r^3$, there is no sense in entertaining the idea that empty space might be four-dimensional.

But the argument is made and sustained by Helmholtz that as two dimensional beings perceive two dimensions only and are unable to think how a third dimension is at all possible, so we tridimensional beings cannot represent in thought the possibility of a fourth dimension. Helmholtz, speaking of beings of only two dimensions living on the surface of a solid body, says:

"If such beings worked out a geometry, they would of course assign only two dimensions to their space. They would ascertain that a point in moving describes a line, and that a line in moving describes a surface. But they could as little represent to themselves what further spatial construction would be generated by a surface moving out of itself, as we can represent what should be generated by a solid moving out of the space we know. By the much-abused expression 'to represent' or 'to be able to think how something happens' I understand—and I do not see how anything else can be understood by it without loss of all meaning—the power of imagining the whole series of sensible impressions that would be had in such a case. Now, as no sensible impression is known relating to such an unheard-of event, as the movement to a fourth dimension would be to us, or as a movement to our third dimension would be to the inhabitants of a surface, such a 'representation' is as impossible as the 'representation' of colors would be to one born blind, if a description of them in general terms could be given to him.

"Our surface-beings would also be able to draw shortest lines in their superficial space. These would not necessarily be straight lines in our sense, but what

are technically called *geodetic lines* of the surface on which they live; lines such as are described by a *tense* thread laid along the surface, and which can slide upon it freely."....

"Now, if beings of this kind lived on an infinite plane, their geometry would be exactly the same as our planimetry. They would affirm that only one straight line is possible between two points; that through a third point lying without this line only one line can be drawn parallel to it; that the ends of a straight line never meet though it is produced to infinity, and so on."....

"But intelligent beings of the kind supposed might also live on the surface of a sphere. Their shortest or straightest line between two points would then be an arc of the great circle passing through them."....

"Of parallel lines the sphere-dwellers would know nothing. They would maintain that any two straightest lines, sufficiently produced, must finally cut not in one only but in two points. The sum of the angles of a triangle would be always greater than two right angles, increasing as the surface of the triangle grew greater. They could thus have no conception of geometrical similarity between greater and smaller figures of the same kind, for with them a greater triangle must have different angles from a smaller one. Their space would be unlimited, but would be found to be finite or at least represented as such.

"It is clear, then, that such beings must set up a very different system of geometrical axioms from that of the inhabitants of a plane, or from ours with our space of three dimensions, though the logical powers of all were the same."

I deny what Helmholtz implicitly assumes that sensible impressions are needed to enable us to represent purely formal relations. Thus we have the idea of a surface as a boundary between solids, but surfaces do not exist in reality. All real objects are solid, and our idea of surface is a mere abstraction. Two dimensional things are unreal, and yet we form the notion of surfaces, and lines, and points, and pure space, etc. There is no straight line in existence, yet we have the notion of a straight line. The straight lines on paper are incorrect pictures of the true straight lines which are purely ideal constructions. Our *a priori* constructions are not a product of our sense-impressions, but are independent of sense or anything sensed. They are purely formal, and even if we grant that two-dimensional beings were possible, we would have no reason to assume that two-dimensional beings could not construct a tridimensional space-conception.

Two-dimensional beings could not be possessed of a material

body, because their absolute flatness substantially reduces their shape to nothingness. But if they existed, they would be limited to movements in two directions and thus must be expected to be incredulous as to the possibility of jumping out of their flat existence and returning into it through a third dimension. Having never moved in a third dimension, they could speak of it as the blind might discuss colors; in their flat minds they could have no true conception of its significance and would be unable clearly to picture it in their imagination; but for all their limitations, they could very well develop the abstract idea of tri-dimensional space and therefrom derive all particulars of its laws and conditions and possibilities.

We ourselves are tridimensional; we can measure the space in which we move with three coördinates, yet we can definitely say that if space were four-dimensional, a body constructed of two factors, so as to have a four-dimensional solidity, would be expressed in the formula:

$$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4.$$

We can calculate, compute, excogitate, and describe all the characteristics of four-dimensional space, so long as we remain in the realm of abstract thought and do not venture to make use of our motility and execute our plan in an actualised construction of motion. From the standpoint of pure logic, there is nothing irrational about the assumption; but as soon as we make an *a priori* construction of the scope of our motility, we find out the incompatibility of the whole scheme. Helmholtz continues:

"But let us proceed still farther.

"Let us think of reasoning beings existing on the surface of an egg-shaped body. Shortest lines could be drawn between three points of such a surface and a triangle constructed. But if the attempt were made to construct congruent triangles at different parts of the surface, it would be found that two triangles, with three pairs of equal sides, would not have their angles equal."

If there were two-dimensional beings living on an egg-shell, they would most likely have to determine the place of their habitat by experience just as much as we tridimensional beings living on a

flattened sphere have to map out our world by measurements made *a posteriori* and based upon *a priori* systems of measurement.

If the several systems of space-measurement were not *a priori* constructions, how could Helmholtz who does not belong to the class of two-dimensional beings tell us what their notions must be like?

I claim that if there were surface beings on a sphere or on an egg-shell, they would have the same *a priori* notions as we have; they would be able to construct straight lines, even though they were constrained to move in curves only; they would be able to define the nature of a space of three dimensions and would probably locate in the third dimension their gods and the abode of spirits. I insist that not sense experience, but *a priori* considerations, teach us the notions of straight lines.

The truth is that we tridimensional beings actually do live on a sphere, and we cannot get away from it. What is the highest flight of an æronaut and the deepest descent into a mine if measured by the radius of the earth? If we made an exact imitation of our planet, a yard in diameter, it would be like a polished ball, and the highest elevations would be less than a grain of sand; they would not be noticeable were it not for a difference in color and material.

When we become conscious of the nature of our habitation, we do not construct *a priori* conceptions accordingly, but feel limited to a narrow surface and behold with wonder the infinitude of space beyond. We can very well construct other *a priori* notions which would be adapted to one, or two, or four-dimensional worlds, or to spaces of positive or of negative curvatures, for all these constructions are ideal; they are mind-made, and we select from them the one that would best serve our purpose of space-measurement.

The claim is made that if we were four-dimensional beings, our present three-dimensional world would appear to us as flat and shallow, as the plane is to us in our present tridimensional predicament. That statement is true, because it is conditioned by an "if." And what pretty romances have been built upon it! I remind my reader only of the ingenious story *Flatland, Written by a*

Square, and portions of Wilhelm Busch's charming tale *Edward's Dream*[1]; but the worth of conditional truths depends upon the assumption upon which they are made contingent, and the argument is easy enough that if things were different, they would not be what they are. If I had wings, I could fly; if I had gills I could live under water; if I were a magician I could work miracles.

INFINITUDE.

The notion is rife at present that infinitude is self-contradictory and impossible. But that notion originates from the error that space is a thing, an objective and concrete reality, if not actually material, yet consisting of some substance or essence. It is true that infinite things cannot exist, for things are always concrete and limited; but space is pure potentiality of concrete existence. Pure space is materially considered nothing. That this pure space (this apparent nothing) possesses some very definite positive qualities is a truth which at first sight may seem strange, but on closer inspection is quite natural and will be conceded by every one who comprehends the paramount significance of the doctrine of pure form.

Space being pure form of extension, it must be infinite, and infinite means that however far we go, in whatever direction we choose, we can go farther, and will never reach an end. Time is just as infinite as space. Our sun will set and the present day will pass away, but time will not stop. We can go backward to the beginning, and we must ask what was before the beginning. Yet suppose we could fill the blank with some hypothesis or another, mythological or metaphysical, we would not come to an absolute beginning. The same is true as to the end. And if the universe broke to pieces, time would continue, for even the duration in which the world would lie in ruins would be measurable.

Not only is space as a totality infinite, but in every part of space we have infinite directions.

What does it mean that space has infinite directions? If you

[1] *The Open Court*, Vol. VIII., p. 4266 et seq.

lay down a direction by drawing a line from a given point, and continue to lay down other directions, there is no way of exhausting your possibilities. Light travels in all directions at once; but "all directions" means that the whole extent of the surroundings of a source of light is agitated, and if we attempt to gather in the whole by picking up every single direction of it, we stand before a task that cannot be finished.

In the same way any line, though it be of definite length, can suffer infinite division, and the fraction $\frac{1}{3}$ is quite definite while the same amount if expressed in decimals as $0.333\ldots$, can never be completed. Light actually travels in all directions, which is a definite and concrete process, but if we try to lay them down one by one we find that we can as little exhaust their number as we can come to an end in divisibility or as we can reach the boundary of space, or as we can come to an ultimate number in counting. In other words reality is actual and definite but our mode of measuring it or reducing it to formulas admits of a more or less approximate treatment only, being the function of an infinite progress in some direction or other. There is an objective *raison d'être* for the conception of the infinite, but our formulation of it is subjective, and the puzzling feature of it originates from treating the subjective feature as an objective fact.

These considerations indicate that infinitude does not appertain to the thing, but to our method of viewing the thing. Things are always concrete and definite, but the relational of things admits of a progressive treatment. Space is not a thing, but the relational feature of things. If we say that space is infinite, we mean that a point may move incessantly and will never reach the end where its progress would be stopped.

There is a phrase current that the finite cannot comprehend the infinite. Man is supposed to be finite, and the infinite is identified with God or the Unknowable, or anything that surpasses the comprehension of the average intellect. The saying is based upon the prejudicial conception of the infinite as a realised actuality, while the infinite is not a concrete thing, but a series, a process, an aspect, or the plan of action that is carried on without stopping

and shall not, as a matter of principle, be cut short. Accordingly, the infinite (though in its completeness unactualisable) is neither mysterious nor incomprehensible, and though mathematicians be finite, they may very successfully employ the infinite in their calculations.

I do not say that the idea of infinitude presents no difficulties, but I do deny that it is a self-contradictory notion and that if space must be conceived to be infinite, mathematics will sink into mysticism.

GEOMETRY REMAINS A PRIORI.

Those of our readers who have closely followed our arguments will now understand how in one important point we cannot accept Mr. B. A. W. Russell's statement as to the main result of the metageometrical inquisitions. He says:

"There is thus a complete divorce between geometry and the study of actual space. Geometry does not give us certain knowledge as to what exists. That peculiar position which geometry formerly appeared to occupy, as an *a priori* science giving knowledge of something actual, now appears to have been erroneous. It points out a whole series of possibilities, each of which contains a whole system of connected propositions; but it throws no more light upon the nature of our space than arithmetic throws upon the population of Great Britain. Thus the plan of attack suggested by non-Euclidean geometry enables us to capture the last stronghold of those who attempt, from logical or *a priori* considerations, to deduce the nature of what exists. The conclusion *suggested* is, that no existential proposition can be deduced from one which is not existential. But to *prove* such a conclusion would demand a treatise upon all branches of philosophy."[1]

It is a matter of course that the single facts as to the population of Great Britain must be supplied by counting, and in the same way the measurement of angles and actual distances must be taken by *a posteriori* transactions; but having ascertained some lines and angles, we can (assuming our data to be correct) calculate other items with absolute exactness by purely *a priori* argument. There is no need (as Mr. Russell puts it) "from logical or *a priori* considerations to deduce the nature of what exists,"—

[1] In *the new volumes of the Encyclopædia Britannica*, Vol. XXVIII., of the complete work, *s. v.* Geometry, Non-Euclidean, p. 674.

which seems to mean, to determine special features of concrete instances. No one ever assumed that the nature of particular cases, the qualities of material things, or sense-affecting properties, could be determined by *a priori* considerations. The real question is, whether or not the theorems of space relations and, generally, purely formal conceptions, such as are developed *a priori* in geometry and kindred formal sciences, will hold good in actual experience. In other words, can we assume that form is an objective quality, which would imply that the constitution of the actual world must be the same as the constitution of our purely *a priori* sciences? We answer this latter question in the affirmative.

We cannot determine by *a priori* reasoning the population of Great Britain. But we can *a posteriori* count the inhabitants of several towns and districts, and determine the total by addition. The rules of addition, of division, and multiplication can be relied upon for the calculation of objective facts.

Or to take a geometrical example. When we measure the distance between two observatories and also the angles at which at either end of the line thus laid down the moon appears in a given moment, we can calculate the moon's distance from the earth; and this is possible only on the assumption that the formal relations of objective space are the same as those of mathematical space. In other words, that our *a priori* mathematical calculations can be made to throw light upon the nature of space,—the real objective space of the world in which we live.

* * *

The result of our inquisition is quite conservative. It reëstablishes the apriority of mathematical space, yet in doing so it justifies the method of metaphysicians in their constructions of the several non-Euclidean systems. *A priori* considered, the latter have equal rights with plane geometry, but for all that Euclidean geometry, which in the parallel theorem takes the bull by the horns, will remain classical forever, for after all the non-Euclidean systems cannot avoid developing the notion of the straight line or other even boundaries. Any geometry could, within its own premises, be utilised for a determination of objective space; but we will

naturally give the preference to plane geometry, not because it is truer, but because it is simpler and will therefore be more serviceable.

How an ideal (and apparently purely subjective) construction can give us any information of the objective constitution of things, viz., so far as space-relations are concerned seems mysterious but the problem is solved if we bear in mind the objective nature of the *a priori*,—a subject which we have discussed in a previous chapter.[1]

SENSE-EXPERIENCE AND SPACE.

We have learned that sense-experience cannot be used as a source from which we construct our fundamental notions of geometry, yet sense-experience justifies them.

Experience can verify *a priori* constructions (as, e. g., tridimensionality is verified in Newton's laws), and can never change them. If experience does not tally with our calculations, we have either made a mistake or made a wrong observation. For our *a priori* conceptions hold good for any conditions, and their theory can be as little wrong as reality can be inconsistent.

However, some of the most ingenious thinkers and great mathematicians do not conceive of space as mere potentiality of existence, which renders it formal and purely *a priori*, but think of it as a concrete reality, as though it were a big box, presumably round, like an immeasurable sphere. If it were such, space would be (as Riemann says) boundless but not infinite, for we cannot find a boundary on the surface of a sphere, and yet the sphere has a finite surface that can be expressed in definite numbers.

I should like to know what Riemann would call that something which lies outside of his spherical space. Would the name "province of the extraspatial" perhaps be an appropriate term? I do not know how we can rid ourselves of this enormous portion of unutilised outside room. Strange though it may seem, this space-conception of Riemann counts among its advocates mathematicians

[1] See also the author's exposition of the problem of the *a priori* in his edition of *Kant's Prolegomena*, pp. 167–240.

of first rank, among whom I will here mention only the name of Sir Robert Ball.

It will be interesting to hear a modern thinker who is strongly affected by metageometrical studies, on the nature of space. Mr. Charles S. Peirce, an uncommonly keen logician and an original thinker of no mean repute, proposes the following three alternatives. He says:

"First, space is, as Euclid teaches, both *unlimited* and *immeasurable*, so that the infinitely distant parts of any plane seen in perspective appear as a straight line, in which case the sum of the three angles of a triangle amounts to 180°; or,

"Second, space is *immeasurable* but *limited*, so that the infinitely distant parts of any plane seen in perspective appear as a circle, beyond which all is blackness, and in this case the sum of the three angles of a triangle is less than 180° by an amount proportional to the area of the triangle; or

"Third, space is *unlimited* but *finite* (like the surface of a sphere), so that it has no infinitely distant parts; but a finite journey along any straight line would bring one back to his original position, and looking off with an unobstructed view one would see the back of his own head enormously magnified, in which case the sum of the three angles of a triangle exceeds 180° by an amount proportional to the area.

"Which of these three hypotheses is true we know not. The largest triangles we can measure are such as have the earth's orbit for base, and the distance of a fixed star for altitude. The angular magnitude resulting from subtracting the sum of the two angles at the base of such a triangle from 180° is called the star's *parallax*. The parallaxes of only about forty stars have been measured as yet. Two of them come out negative, that of Arided (α Cycni), a star of magnitude 1½, which is —0."082, according to C. A. F. Peters, and that of a star of magnitude 7¾, known as Piazzi III 422, which is —0."045 according to R. S. Ball. But these negative parallaxes are undoubtedly to be attributed to errors of observation; for the probable error of such a determination is about ±0."075, and it would be strange indeed if we were to be able to see, as it were, more than half way round space, without being able to see stars with larger negative parallaxes. Indeed, the very fact that of all the parallaxes measured only two come out negative would be a strong argument that the smallest parallaxes really amount to +0."1, were it not for the reflexion that the publication of other negative parallaxes may have been suppressed. I think we may feel confident that the parallax of the furthest star lies somewhere between —0."05 and +0."15, and within another century our grandchildren will surely know whether the three angles of a triangle are greater or less than 180°,—that they are *exactly* that amount is what nobody ever can be justified in concluding. It is true that according to the axioms of geometry the sum of the

three sides of a triangle are precisely 180°; but these axioms are now exploded, and geometers confess that they, as geometers, know not the slightest reason for supposing them to be precisely true. They are expressions of our inborn conception of space, and as such are entitled to credit, so far as their truth could have influenced the formation of the mind. But that affords not the slightest reason for supposing them exact." (*The Monist*, Vol. I., pp. 173–174.)

Now, let us for argument's sake assume that the measurements of star-parallaxes unequivocally yield results which indicate that the sum of the angles in cosmic triangles is either a trifle more or a trifle less than 180°; would we have to conclude that cosmic space is curved, or would we not have to look for some concrete and special cause for the aberration of the light? If the moon is eclipsed while the sun still appears on the horizon, it proves only that the refraction of the solar rays makes the sun appear higher than it really stands, if its position is determined by a straight line, but it does not refute the straight line conception. Measurements of star parallaxes (if they could no longer be accounted for by the personal equation of erroneous observation), may prove that ether can slightly deflect the rays of light, but it will never prove that the straight line of plane geometry is really a curve. We might as well say that the norms of logic are refuted when we make faulty observations or whenever we are confronted by contradictory statements. No one feels called upon, on account of the many lies that are told, to propose a theory on the probable curvature of logic. Yet seriously speaking, in the province of pure being the theory of a curved logic has the same right to a respectful hearing as the curvature of space in the province of the scope of pure motility.

Ideal constructions, like the systems of geometry, logic, etc., cannot be refuted by facts. Our observation of facts may call attention to the logical mistakes we have made, but experience cannot overthrow logic itself or the principles of thinking. They bear their standard of correctness in themselves which is based upon the same principle of consistency that pervades any system of actual or purely ideal operations.

But if space is not round, are we not driven to the other horn of the dilemma that space is infinite?

Perhaps we are. What of it? I see nothing amiss in the idea of infinite space.

By the by, if objective space really is curved, would not the probability be one to infinity that its twist can scarcely be limited to the curvature of a circle, but will deviate as well in some other direction so that the straightest line would be spiral? And the spiral is as infinite as the straight line. Obviously, curved space does not get rid of infinitude; besides the infinitely small, which would not be thereby eliminated, is not less troublesome than the infinitely great.

THE TEACHING OF MATHEMATICS.

Euclid avoided the word axiom and I believe with Grassmann, that its omission in the *Elements* is not accidental but well-considered intention. The introduction of the term among Euclid's successors is due to a lack of clearness as to the nature of geometry and the conditions through which its fundamental notions originate.

It may be a flaw in the Euclidean *Elements* that the construction of the plane is presupposed, but it does not invalidate the details of his glorious work which will forever remain classical.

The invention of other geometries can only serve to illustrate the truth that all geometries, the plane geometry of Euclid included, are *a priori* constructions, and were not for obvious reasons Euclid's plane geometry preferable, other systems might as well be employed for the purpose of space-determination. Neither homaloidality nor curvature belongs to space; they belong to the several systems of manifolds that can be invented for the determination of the juxtaposition of things, called space.

If I had to rearrange the preliminary expositions of Euclid, I would state first the *Common Notions* which embody those general principles of Pure Reason and are indispensable for geometry. Then I would propose the *Postulates* which set forth our own activity (viz., the faculty of construction) and the conditions under which we intend to carry out our operations, viz., the obliteration of all particularity, characterisable as "anyness of motion," and finally I

would lay down the *Definitions* as the most elementary constructions which are to serve as tools and objects for experiment in the further expositions of geometry. There would be no mention of axioms, nor would we have to regard anything as an assumption or an hypothesis.

Professor Hilbert has methodically arranged the principles that underlie mathematics, and the excellency of his work is universally recognised.[1] It is a pity, however, that he retains the term "axiom," and we would suggest replacing it by some other appropriate word. "Axiom" with Hilbert does not mean an obvious truth that does not stand in need of proof, but principle, or rule, viz., a formula describing certain general characteristic conditions.

Mathematical space is an ideal construction, and as such it is *a priori*. But its apriority is not as rigid as is the apriority of logic. It presupposes not only the rules of pure reason but also our own activity (viz., pure motility) both being sufficient to create any and all geometrical figures *a priori*.

Boundaries that are congruent with themselves being limits that are unique recommend themselves as standards of measurement. Hence the significance of the straight line, the plane, and the right angle.

The theorem of parallels is only a side issue of the implications of the straight line.

The postulates that figures of the same relations are congruent in whatever place they may be, and also that similar figures can be drawn to any figure, is due to our abstraction which creates the condition of anyness.

The teaching of mathematics, now utterly neglected in the public schools and not specially favored in the high schools, should begin early, but Euclid's method with his pedantic propositions and proofs should be replaced by construction work. Let children begin geometry by doing, not by reasoning. The reasoning faculties are not yet sufficiently developed in a child. Abstract reasoning is tedious, but if it comes in as an incidental aid to construc-

[1] *The Foundations of Geometry*, The Open Court Pub. Co., Chicago, 1902.

tion, it will be welcome. Action is the main-spring of life and the child will be interested so long as there is something to achieve.[1]

Lines must be divided, perpendiculars dropped, parallel lines drawn, angles measured and transferred, triangles constructed, unknown quantities determined with the help of proportion, the nature of the triangle studied and its internal relations laid down and finally the right-angled triangle computed by the rules of trigonometry, etc. All instruction should consist in giving *tasks to be performed, not theorems to be proved;* and the pupil should find out the theorems merely because he needs them for his construction.

In the triangle as well as in the circle we should accustom ourselves to using the same names for the same parts.[2]

Every triangle is ABC. The angle at A is always α, on B β, on C γ. The side opposite A is a, opposite B b, opposite C c. The three heights are h_a, h_b, h_c. The lines that from A, B, and C pass through the center of gravity to the middle of the opposite sides I propose to call gravitals and would designate them g_a, g_b, g_c. The perpendiculars erected upon the middle of the sides meeting in the center of the circumscribed circle are p_a, p_b, p_c. The lines that divide the angles α, β, γ and meet in the center of the inscribed circle I propose to call "dichotoms" (from διχότομος[3]) and would designate them as d_a, d_b, d_c. The radius of the circumscribed circle is r, of the inscribed circle ρ, and the radii of the three ascribed circles are ρ_a, ρ_b, ρ_c. The point where the three heights meet is H, where the three gravitals meet R, where the three dichotoms meet O.[4] The stability of designation will be indispensable for a clear comprehension of these important interrelated parts.

EPILOGUE.

While matter is eternal and energy is indestructible, forms change; yet there is a feature in the changing forms of matter and

[1] Cp. the author's article "Anticipate the School" (*Open Court*, 1899, p. 747).

[2] Such was the method of my teacher Prof. Hermann Grassmann.

[3] I purposely avoid the term *median* which is sometimes used in the sense of gravitals, sometimes as dichotoms. Thus the word median remains reserved for a general use.

[4] The capital of the Greek ρ is objectionable, because it cannot be distinguished from the Roman P.

energy that does not change. It is the norm that determines the nature of all formations, commonly called law or uniformity.

The law of form is the condition that dominates our thinking and constitutes the norm of all formation, the principle of consistency which underlies our ideas of sameness, uniformity, rule, etc. This norm is not a concrete fact of existence but the universal feature that permeates both the anyness of our mathematical constructions and the anyness of objective conditions. Its application produces in the realm of mind the *a priori*, and in the domain of facts the uniformities of events which our scientists reduce to formulas, called laws of nature. On a superficial inspection it is pure nothingness, but in fact it is universality, eternality, and omnipresence; and it is the factor objectively of the world order and subjectively of science, the latter being man's capability of reducing the innumerable sense-impressions of experience to a methodical system of knowledge.

Faust, seeking the ideal of beauty, is advised to search for it in the domain of the eternal types of existence, which is the omnipresent Nowhere, the ever-enduring Never. Mephistopheles calls it the Naught.[1] The norm of being, the foundation of natural law, the principle of thinking, is non-existent to Mephistopheles, and in his way Mephistopheles is right: but it is at the same time the rock of ages, it is the divinity of existence, and we might as well answer with a slight change of words, replacing "All" by "God," thus intensifying the meaning of Faust's reply:

"'Tis in thy naught I hope to find my God."

The norm of Pure Reason, the factor that shapes the world, the eternal Logos, is omnipresent and eternal. It is God. The laws of nature have not been fashioned by a creator, they are part and parcel of the creator himself. Plutarch tells us that Plato said that God was always geometricising.[2] In other words, the purely

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[1] Cf. above the chapter on "The Apriori and the Purely Formal."

[2] Plutarchus *Convivia*, VIII., 2: *πῶς Πλάτων ἔλεγε τὸν Θεὸν ἀεὶ γεωμετρεῖν.* Having hunted in vain for the famous passage, I am indebted for the reference to Professor Ziwet of Ann Arbor, Mich.

formal theorems of mathematics and logic are the thoughts of God. Our thoughts are fleeting, but God's thoughts are eternal and omnipresent verities. They are intrinsically necessary, universal, immutable, and the standard of truth and right.

We repeat, matter is eternal and energy is indestructible, but there is nothing divine in either matter or energy. That which constitutes the divinity of the world is the eternal principle of the laws of existence. That is the creator of the cosmos, the norm of truth, and the standard of right and wrong. If incarnated in living beings, it produces mind, and it continues to be the source of inspiration for aspiring mankind, a refuge of the struggling and storm-tossed sailors on the ocean of life, and the holy of holies of the religious devotee and worshipper.

The norms of logic and of mathematics are uncreate and uncreatable, they are irrefragable and immutable, and no power on earth or in heaven can change them. We can imagine that the world was made by a great world builder, but we cannot think that logic or arithmetic or geometry was ever fashioned by either man, or ghost, or god. Here is the rock on which the old-fashioned theology and all mythological God-conceptions must founder. If God were a being like man, if he had created the world as an artificer makes a tool, or a potter shapes a vessel, we would have to confess that he is a limited being. He would be infinitely greater and more powerful than man, but he would, as much as man, be subject to the same eternal laws, and he would, as much as human inventors and manufacturers, have to mind the multiplication tables, the theorems of mathematics, and the rules of logic.

Happily this conception of the deity may fairly well be regarded as antiquated. We know now that God is not a big individual, like his creatures, but that he is God, creator, law, and ultimate norm of everything. He is not personal but superpersonal. The qualities that characterise God are omnipresence, eternality, intrinsic necessity, etc., and surely wherever we find them we should take off our shoes, for whenever we face eternal verities it is a sign that we are in the presence of God,—not of a mythological God, but the God of the cosmic order, the God of mathematics and

science, the God of ethics. So long as we can trace law in nature, as there is a norm of truth and untruth, and a standard of right and wrong, we need not turn atheists, even though the traditional conception of God is not yet free from crudities and mythological adornments. It will be by far preferable to purify our conception of God and replace the traditional notion which during the unscientific age of human development served man as a useful surrogate, by a new conception of God, that should be higher, and nobler, and better, because truer.

EDITOR.

CAGLIOSTRO—A STUDY IN CHARLATANISM.

"Mundus vult decipi, ergo decipiatur."—*Latin Proverb.*

"The pseudo-mystic, who deceives the world because he knows that the world wishes to be deceived, becomes an attractive subject for psychological analysis."—Hugo Münsterberg: *Psychology and Life.*

I.

MY favorite haunt in Paris is the Quai Voltaire, because of the delightful book-stalls that line its parapet, presided over by the quaintest of Norman bouquinistes. The second-hand literature of the world may be found here. Amid the flotsam and jetsam of old books tossed upon this inhospitable shore of literary endeavor, many a precious Elzevir and Aldus has been picked up. On a pleasant summer day, while strolling along the Quai, I chanced upon a rare volume, entitled: *Vie de Joseph Balsamo, connu sous le nom de Comte Cagliostro. Traduite d'apres l'original italien, imprime à la chambre Apostolique; enriche de notes curieuses, et ornée de son portrait. Paris et Strasbourg, 1791.* Yes, here was the biography of the famous necromancer of the old *régime*, the prince of charlatans, who foretold the fall of the Bastille, the bosom friend of the Cardinal de Rohan, and founder of the Egyptian Rite of Freemasonry. Fascinated with the subject of magic and magicians, I visited the Bibliothèque Nationale and dipped into the literature on Cagliostro. Subsequently, at the British Museum, I examined the rare brochures and old files of the *Courier de l'Europe* for information concerning the incomparable necromancer, who made use of hypnotism, and, like Mesmer, performed many strange feats of

pseudo-magic. Goethe and Catherine II. wrote plays about him, Alexander Dumas made him the hero of a dozen novels, and Thomas Carlyle philosophised concerning him. To understand Cagliostro, one must understand the times in which he lived and acted his strange world-drama, its philosophical and religious background.

The arch-enchanter appeared on this mortal scene when the times were "out of joint." It was the latter part of that strange, romantic eighteenth century of scepticism and credulity. The old

From a painting in the Versailles Historical Gallery.

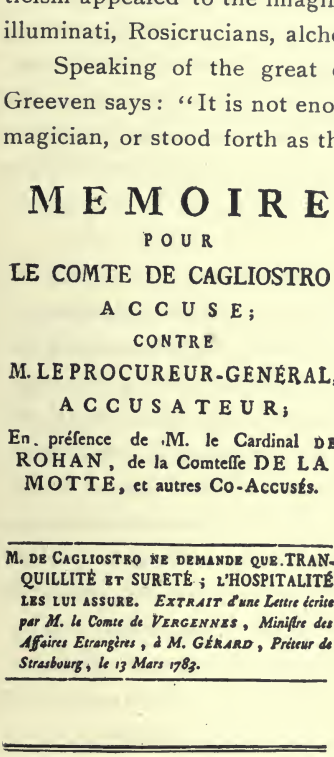
After an engraving which served as a frontispiece of Balsamo's Life, published in 1791.

JOSEPH BALSAMO, KNOWN AS COUNT CAGLIOSTRO.

world like a huge Cheshire cheese was being nibbled away from within, until little but the rind was left to tell the tale. The rotten fabric of French society in particular was about to tumble down in the sulphurous flames of the Revolution, and the very people who were to suffer most in the calamity were doing their best to assist in the process of social and political disintegration, seemingly careless of the impending storm whose black clouds were slowly gathering. The more sceptical the age, the more credulity extant. Man begins by denying, and then doubts his doubts. Charles Kingsley says: "And so it befell, that this eighteenth century, which is usu-

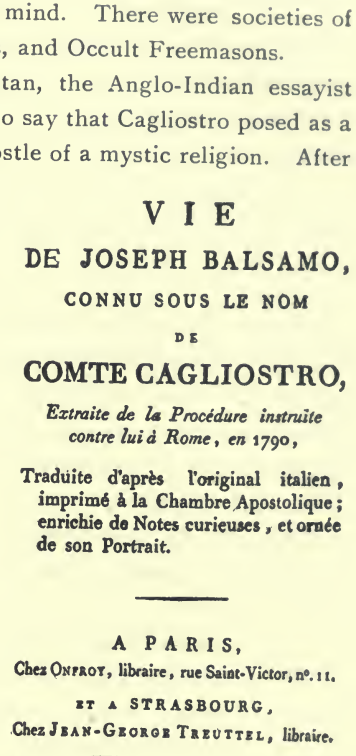
ally held to be the most 'materialistic' of epochs, was in fact a most 'spiritualistic' one." The soil was well fertilised for the coming of Cagliostro, the sower of superstition. Every variety of mysticism appealed to the imaginative mind. There were societies of illuminati, Rosicrucians, alchemists, and Occult Freemasons.

Speaking of the great charlatan, the Anglo-Indian essayist Greeven says: "It is not enough to say that Cagliostro posed as a magician, or stood forth as the apostle of a mystic religion. After


MEMOIRE
POUR
LE COMTE DE CAGLIOSTRO,
ACCUSE;
CONTRE
M. LE PROCUREUR-GENÉRAL,
ACCUSATEUR;
En présence de M. le Cardinal DE ROHAN, de la Comtesse DE LA MOTTE, et autres Co-Accusés.

M. DE CAGLIOSTRO NE DEMANDE QUE TRANQUILLITÉ ET SURETÉ; L'HOSPITALITÉ LES LUI ASSURE. *EXTRAIT d'une Lettre écrite par M. le Comte de VERGENNES, Ministre des Affaires Etrangères, à M. GÉRARD, Préteur de Strasbourg, le 13 Mars 1783.*

1786.
TITLE-PAGE OF THE DEFENSE OF CAGLIOSTRO.


VIE
DE JOSEPH BALSAMO,
CONNU SOUS LE NOM
DE
COMTE CAGLIOSTRO,
Extraite de la Procédure instruite contre lui à Rome, en 1790,
Traduite d'après l'original italien, imprimé à la Chambre Apostolique; enrichie de Notes curieuses, et ornée de son Portrait.

A PARIS,
Chez ONFROY, libraire, rue Saint-Victor, n°. 11.
ET A STRASBOURG,
Chez JEAN-GEORGE TREUTTEL, libraire.

1791.
TITLE-PAGE OF THE LIFE OF CAGLIOSTRO.

all, in its mild way, our own generation puts on its evening dress to worship at the feet of mediums, whose familiar spirits enable them to wriggle out of ropes in cupboards, or to project cigarette papers from the ceiling [*à la* Madame Blavatsky]. We ride our hobby, however, only when the whim seizes us, and, as soon as it wearies, we break it in pieces and fling it aside with a laugh. But Cagliostro impressed himself deeply on the history of his time. He flashed on the world like a meteor. He carried it by storm. Princes and nobles thronged to his 'magic operations.' They prostrated

themselves before him for hours. His horses and his coaches and his liveries rivalled a king's in magnificence. He was offered, and refused, a ducal throne. No less illustrious a writer than the Empress of Russia deemed him a worthy subject of her plays. Goethe made him the hero of a famous drama. A French Cardinal and an English Lord were his bosom companions. In an age which arrogated to itself the title of *the philosophic*, the charm of his eloquence drew thousands to his Lodges, in which he preached the mysteries of his *Egyptian ritual*, as revealed to him by the Grand-Kophta under the shadow of the pyramids."

II.

And now for a brief review of his life. Joseph Balsamo, the son of Peter Balsamo and Felicia Braconieri, both of humble extraction, was born at Palermo, on the eighth day of June, 1743. He received the rudiments of an education at the Seminary of St. Roche, Palermo. At the age of thirteen, according to the Inquisition biographer, he was intrusted to the care of the Father-General of the Benfratelli, who carried him to the Convent of that Order at Cartagirone. There he put on the habit of a novice, and, being placed under the tuition of the apothecary, he learned from him the first principles of chemistry and medicine. He proved incorrigible and was expelled from the monastry in disgrace. Then began a life of dissipation in the city of Palermo. He was accused of forging theatre-tickets and a will. Finally he had to flee the city for having duped a goldsmith named Marano of sixty pieces of gold, by promising to assist him in unearthing a buried treasure by magical means. The superstitious Marano entered a cavern situated in the environs of Palermo, according to instructions given to him by the enchanter, and discovered, not a chest full af gold, but a crowd of Balsamo's confederates, who, disguised as infernal spirits, administered to him a terrible castigation. Furious at the deception, the goldsmith vowed to assassinate the pretended sorcerer. Balsamo, however, took wing to Messina, where he fell in with a strolling mountebank and alchemist named Althotas, or Altotas, who spoke a variety of languages. They travelled to Alexandria in

Egypt, and finally brought up at the island of Malta. Pinto, the Grand Master of the Knights of Malta, was a searcher after the philosopher's stone, an enthusiastic alchemist. He extended a warm reception to the two adventurers, and took them under his patronage. They remained for some time at Malta, working in the laboratory of the deluded Pinto. Eventually Althotas died, and Balsamo went to Naples, afterwards to Rome, where he married a beautiful girdle-maker, named Lorenza Feliciani. Together with a swindler calling himself the Marchese d'Agliata, he had a series of disreputable adventures in Italy, Spain, and Portugal.

Unmasked at one place he fled in hot haste to another. Behold him on his travels with coach-and-four, flunkies and outriders in gorgeous liveries, vehicles filled with baggage and paraphernalia; all alchemists, magicians, and masons must have paraphernalia—retorts, crucibles, alembics, baquets, disguises, mirrors, draperies, candelabra, sashes, swords, etc., etc. Best of all he carries with him an iron coffer, which contains the silver, gold, and jewels reaped from princely dupes. Behold the Arch-Master of Egyptian Masonry, the hero of the Pyramids, the Rosicrucian reputed to be able to make himself invisible, fleeing from the police in fashion prosaic.

In 1776 he arrived in London. He had assumed various aliases during the course of his life, but now he called himself the "Conte di Cagliostro," borrowed from an aunt, who bore the name without the title. His beautiful wife called herself the "Countess Serafina Feliciani." Cagliostro announced himself as a worker of wonders, especially in medicine. He carried about two mysterious substances—a red powder, known as his "Materia Prima," with which he transmuted baser metals into gold, and his "Egyptian Wine," with which he prolonged life.

He dropped hints that he was the son of the Grand-Master Pinto of Malta and the Princess of Trebizonde. He foretold the lucky numbers in a lottery and got into difficulty with a gang of swindlers, which caused him to flee from England to avoid being imprisoned. While in London he picked up, at a second-hand book-stall, the mystic writings of an obscure spiritist, one George

Cofton, or Coston, "which suggested to him the idea of the Egyptian ritual"; and he got himself initiated into a masonic lodge, so say the pamphleteers. It is asserted that he received the degrees of the Blue Lodge in the month of April, 1776, in the Esperance Lodge, No. 369, held at the King's Head Tavern; but there is no documentary evidence in support of this statement. It is difficult to say where Cagliostro was initiated into the degrees of freemasonry. I have had some correspondence with masonic scholars in England and on the Continent, but they have been able to shed no light on the subject. Cagliostro is regarded as the greatest masonic imposter of the world. His pretensions were bitterly repudiated by the English members of the fraternity, and many of the Continental lodges. But the fact remains that he made thousands of dupes. As Grand Master of the Egyptian Rite he leaped at once into fame. His swindling operations were now conducted on a gigantic scale. He had the entrée into the best society. According to him, freemasonry was founded by Enoch and Elias. It was open to both sexes. Its present form, especially with regard to the exclusion of women, is a corruption. The true form was preserved only by the Grand Kophta, or High Priest of the Egyptians. By him it was revealed to Cagliostro. The votaries of any religion are admissible, subject to these conditions, (1) that they believe in the existence of a God; (2) that they believe in the immortality of the soul; and (3) that they have been initiated into common Masonry. The candidate must swear an oath of secrecy, and obedience to the Secret Superiors. It is divided into the usual three grades of Apprentice, Fellowcraft, and Mastermason.

In this system he promised his followers "to conduct them to *perfection*, by means of a *physical and moral regeneration;* to enable them by the former (or physical) to find the *prime matter*, or Philosopher's Stone, and the *acacia*, which consolidates in man the forces of the most vigorous youth and renders them immortal; and by the latter (or moral) to procure them a Pantagon, which should restore man to his primitive state of innocence, lost by original sin."

The meetings of the Egyptian lodges were nothing more than

spiritualistic séances, during which communications were held with the denizens of the celestial spheres, and many mysteries unfolded of time and eternity. The medium was a young lad or a girl, who is in the state of innocence, called the *Pupil* or the *Colomb*. Cagliostro declared Moses, Elias, and Christ to be the Secret Superiors of the Order. "They have attained to such perfection in masonry that, exalted into higher spheres, they are able to create fresh worlds for the glory of the Lord. Each is still the head of a secret community."

No wonder the Egyptian Rite became popular among lovers of the marvellous, for it promised its votaries, who should attain to perfection, or adeptship, the power of transmuting baser metals into gold, or prolonging life indefinitely by means of an elixir; communion with the spirits of the dead, telepathy, etc.

Cagliostro often boasted of his great age. He claimed to have been one of the guests at the marriage feast at Cana and to have witnessed the Crucifixion. From England he went to the Hague, where he inaugurated a lodge of female masons, over which his wife presided as Grand Mistress. Throughout Holland he was received by the lodges with masonic honors—beneath "arches of steel." He discoursed volubly upon magic and masonry to enraptured thousands. In March, 1779, he made his appearance at Mitau, in the Baltic Provinces, which he regarded as the stepping-stone to St. Petersburg. He placed great hope in Catherine II. of Russia—"the avowed champion of advanced thought." He hoped to promulgate widely his new and mysterious religious cult in the land of the Czars, with all the pomp and glamour of the East. The nobility of Kurland received him with open arms. Some of them offered to place him on the ducal throne, so he claimed. He wisely refused the offer. Cagliostro eventually made a fiasco at Mitau and left in hot haste. In St. Petersburg his stay was short. Catherine II. was too clever a woman to be his dupe. She ordered the charlatan to leave Russia, which he forthwith did. Prospects of Siberia doubtless hastened his departure. In May, 1780, he turned up at Warsaw. A leading prince lodged him in his palace. Here Cagliostro "paraded himself in the white

shoes and red heels of a noble." His spirit séances were not a success. He chose as his clairvoyant a little girl, eight years of age. After pouring oil into her hands, he closed her in a room, the door of which was hung with a black curtain. The spectators sat outside. He interrogated the child concerning the visions that appeared to her. Among other tests, he requested the spectators to inscribe their names on a piece of paper which he appeared to burn before their very eyes. Calling to the child that a note would flutter down at her feet, he requested her to pass it to him through the door. He passed his hand through the opening of the door to receive the note. In the next instant he produced a note closed with a freemason's seal, which contained the signatures of each of the spectators. This was nothing more than the trick of a prestidigitateur, such as was performed by Philadelphia and Pinetti, the two great sleight-of-hand artists of the period. The next day the clairvoyant confessed the fact that she had been tutored by the magician, and that the visions were but figments of the imagination. Cagliostro secured a new subject, a girl of sixteen, but had the folly to fall in love with his accomplice. In exasperation she repeated the confession of her predecessor. The Polish nobles now insisted that Cagliostro invoke the spirit of the Grand Kophta (the Egyptian High Priest). This séance took place "in a dark room, on a sort of stage, lit with two candles only, and filled with clouds of incense." The Grand Kophta appeared. Through the uncertain light the spectators beheld an imposing figure in white robes and turban. A snowy beard fell upon its breast.

"What see ye?" cried in a hoarse voice the sage of the pyramids.

"I see," replied a sceptical gentleman from the audience, "that Monsieur le Comte de Cagliostro has disguised himself with a mask and a white beard."

Everybody recognised the portly figure of the vision. A rush seemed imminent. Quick as thought, the Grand Kophta, by a wave of his hands, extinguished the two candles. A sound followed as the slipping off of a mantle. The tapers were relit. Cagliostro was observed sitting where the sage had disappeared.

At Wola, in a private laboratory, he pretended to transmute mercury into silver. The scene must have been an impressive one. Girt with a freemason's apron, and standing on a black floor marked with cabalistic symbols in chalk, Cagliostro worked at the furnace. In the gloom of twilight the proceedings were held. By a clever substitution of crucibles, Cagliostro apparently accomplished the feat of transmutation, but the fraud was detected the next morning, when one of the servants of the house discovered the original crucible containing the mercury, which had been cast upon a pile of rubbish by the pretended alchemist, or one of his confederates.

In September, 1780, Cagliostro arrived at Strasburg. Here he was received with unbounded enthusiasm. He lavished money right and left, cured the poor without pay, and treated the great with haughtiness. Just outside of the city he erected a country villa in Chinese architecture, wherein to hold his Egyptian lodges. This place was long pointed out as the Cagliostræum. The peasants are said to have passed it with uncovered heads, such were their admiration and awe of the great wonder-worker. At Strasburg resided at that time the Cardinal Louis de Rohan, who was anxious to meet the magician. Cagliostro, to whom the fact was reported, said: "If the Cardinal is sick, he may come to me and I will cure him; if he is well, he has no further need of me, nor I of him." Cardinal de Rohan, enormously rich, a libertine, an amateur dabbler in alchemy and the occult sciences, was now more anxious than ever to become acquainted with the charlatan. Such disdain on the part of a layman was a new experience to the haughty churchman. His imagination, too, was fired by the stories told of the enchanter. The upshot of it was that Cagliostro and the Cardinal became bosom friends. The prelate invited the juggler and his wife to live at his episcopal palace.

The Baroness Oberkirch who saw him there says in her memoirs: "No one can ever form the faintest idea of the fervor with which everybody pursued Cagliostro. He was surrounded, besieged; every one trying to win a glance or a word....A dozen ladies of rank and two actresses had followed him in order to con-

tinue their treatment.... If I had not seen it, I should never have imagined that a Prince of the Roman Church, a man in other respects intelligent and honorable, could so far let himself be imposed upon as to renounce his dignity, his free will, at the bidding of a sharper."

Cagliostro said to the Cardinal one day: "Your soul is worthy of mine, and you desire to be the confidant of all my secrets." He presented the Cardinal with a diamond worth 20,000 francs which he pretended to have made, the churchman claiming to have been an eye-witness of the operation. The Cardinal said to the Baroness: "But that is not all; he makes gold: he has made five or six thousand francs worth before me, up there in the top of the palace. I am to have more; I am to have a great deal; he will make me the richest prince in Europe. These are not dreams, madame; they are proofs. And his prophecies that have come true! And the miraculous cures that he has wrought! [*He really cured the Cardinal of the asthma.*] I tell you, he is the most extraordinary man, the sublimest man in the world."

Finally he bade adieu to Strasburg, and set out for Lyons in great pomp, with lackeys, grooms, guards armed with battle-axes, and heralds garbed in cloth of gold, blowing trumpets. In the year 1785 he founded at Lyons the Lodge of Triumphant Wisdom, and made many converts to his mystical doctrines. The fame of his Egyptian masonry reached Paris and created quite a stir among the lodges. The chiefs of a masonic convocation assembled in Paris wrote to him for information concerning his new rite. He scornfully refused to have anything to do with them, unless they burned all their masonic books and implements as useless trash and acknowledged their futility, claiming that his Egyptian Rite was the only true freemasonry and worthy of cultivation among men of learning. His next move was to the French Capital.

Cagliostro's greatest triumph was achieved at Paris. A gay and frivolous aristocracy, mad after new sensations, welcomed the magician with open arms. The way had been paved for him by St. Germain and Mesmer. He made his appearance in the French Capital January 30, 1785. Fantastic stories were circulated about

him. The Cardinal de Rohan selected and furnished a hotel for him, and visited him three or four times a week, arriving at dinner time and remaining until an advanced hour in the night. It was said that the great Cardinal assisted the sorcerer in his labors, and many persons spoke of the mysterious laboratory where gold bubbled and diamonds sparkled in crucibles brought to a white heat. But nobody except Cagliostro, and perhaps the Cardinal, ever entered that mysterious laboratory. All that was known for a certainty was that the apartments were furnished with Oriental splendor, and that Count Cagliostro in a dazzling costume received his guests with kingly dignity, and gave them his hand to kiss. Upon a black marble slab in the antechamber carved in golden letters was the universal prayer of Alexander Pope. "Father of all! in every age," etc., the parody of which ten years later Paris sang as a hymn to the Supreme Being.

Says Funck-Brentano in *The Diamond Necklace*:[1] "At Paris Cagliostro showed himself what he had been at Strasburg, dignified and reserved. He refused with haughtiness the invitations to dinner sent to him by the Count of Artois, brother of the king, and the Duke of Chartres, prince of the blood. He proclaimed himself chief of the Rosicrucians, who regarded themselves as chosen beings placed above the rest of mankind, and he gave to his adepts the rarest pleasure.... To all who pressed him with questions as to who he was, he replied in a grave voice, knitting his eyebrows and pointing his forefinger towards the sky, 'I am he who is'; and as it was difficult to make out that he was 'he who is not,' the only thing was to bow with an air of profound deference.

"He possessed the science of the ancient priests of Egypt. His conversation turned generally on three points: (1) Universal Medicine, of which the secrets were known to him. (2) Egyptian Freemasonry, which he wished to restore, and of which he had just established a parent lodge at Lyons, for Scotch masonry, then predominant in France, was in his eyes only an inferior, degenerate form. (3) The Philosopher's Stone, which was to ensure the transmutation of all the imperfect metals into fine gold.

[1] Translated by H. S. Edwards, Philadelphia, 1901.

"He thus gave to humanity, by his universal medicine, bodily health; by Egyptian masonry, spiritual health; and by the philosopher's stone, infinite wealth." These were his principal secrets, but he had a host of others, that of predicting the winning numbers in lotteries; prophesying as to the future; softening marble and restoring it to its pristine hardness; of giving to cotton the lustre and softness of silk, which has been re-invented in our day by a chemical process.

Among the many stories told of Cagliostro, that of the supper in the hotel of the Rue Saint Claude, where the ghosts made merry, still holds the record. Six guests and the host took their places at a round table upon which there were thirteen covers. Each guest pronounced the name of the dead man whose spirit he wished to appear at the banquet table. Cagliostro, concentrating his mysterious forces, gave the invitation in a solemn and commanding tone. One after another the six guests appeared. They were the Duc de Choiseul, Voltaire, d'Alembert, Diderot, the Abbe de Voisenon, and Montesquieu.

"When the living diners recovered their breath, the conversation began, but, unfortunately for the great ghosts, the record of their conversation makes them talk stupid nonsense. Perhaps this may be taken as evidence of the theory that a man loses his head when he dies. At all events, the story created a sensation in Paris. It reached the court, and one evening, when the conversation turned upon the banquet of the ghosts, the king frowned, shrugged his shoulders, and resumed his game of cards. The queen became indignant, and forbade the mention of the name of the charlatan in her presence. Nevertheless, some of the light-headed ladies of the court burned for an introduction to the superb sorcerer. They begged Lorenza Feliciani to get him to give them a course of lectures or lessons in magic to which no gentlemen were to be admitted. Lorenza replied that he would consent, provided there were thirty-six pupils. The list was made up in a day, and a week afterward the fair dames got their first lesson. But they talked of it, and of course the story got loose. This caused another scandal, and consequently the first lesson was the last."

Cagliostro's Egyptian Rite of Masonry was well received in Paris, especially the lodge for ladies, which was presided over by the beautiful Lorenza, his wife. It was appropriately called *Isis*. Among the members of this female lodge were the Countesses de Brienne, Dessalles, de Polignac, de Brissac, de Choiseul, d'Espinchal, the Marchioness d'Avrincourt, and Mmes. de Loménie, de Genlis, de Bercy, de Trevières, etc.

Cagliostro lived like a lord, thanks to the revenues obtained from the initiates into his masonic rite, and the money which he unquestionably received from his dupe, the Cardinal de Rohan, who was magic mad.

"His wife," says a gossipy writer, "was rarely seen, but by all accounts she was a woman of bewildering beauty, realising the Greek lines in all their antique purity and enhanced by an Italian expression. The most enthusiastic of her so-called admirers were precisely those who had never seen her face. There were many duels to decide the question as to the color of her eyes, some contending that they were black, and others that they were blue. Duels were also fought over a dimple which some admirers insisted was on the right cheek, while others said that the honor belonged to the left cheek. She appeared to be no more than twenty years old but she spoke sometimes of her eldest son, who was for some years a captain in the Dutch army."

The magician's sojourn in Paris caused the greatest excitement. Prints, medallions, and marble busts of him were to be seen everywhere. He was called by his admirers "the divine Cagliostro." To one of the old portraits was appended the following verse:

"De l'Ami des Humains reconnaissez les traits:
Tous ses jours sont marqués par de nouveaux bienfaits,
Il prolonge la Vie, il secourt l'indigence;
Le plaisir d'être utile est seul sa récompense."

Hats and neckties were named after him. In Paris as in Strasburg, he gave away large sums of money to the poor and cured them of their ailments free of charge. His mansion was always crowded with noble guests. The idle aristocracy could find noth-

ing better to do than attend the spirit séances of the charlatan. The shades of Voltaire, Rousseau, and other dead celebrities were summoned from the "vasty deep," impersonated doubtless by clever confederates in the pay of Cagliostro, often aided by mechanical and optical accessories. The art of phantasmagoria, in which the concave mirror plays a part, was well known to the enchanter. The Count de Beugnot gives in detail, in his interest-

BUST OF CAGLIOSTRO.
After Houdon.
(In the possession of M. Storelli.)

CAGLIOSTRO.
From *Vie de Joseph Balsamo, etc.*
Paris, 1791.

ing autobiography, an account of Cagliostro's performances at the residences of Madame de la Motte and the Cardinal De Rohan. Abridged by Saint Amand, we have the following statement: "As a sorcerer, he [Cagliostro] had a cabalistic apparatus. On a table with a black cloth, on which were embroidered in red the mysterious signs of the highest degree of the Rosicrucians, there stood the

emblems; little Egyptian figures, old vials filled with lustral waters, and a crucifix very like, though not the same as, the Christian's cross; and there, too, Cagliostro placed a glass globe filled with clarified water. Before the globe he used to place a kneeling seer; that is to say, a young woman who, by supernatural powers, should behold the scenes which were believed to take place in the water within the magic globe."

In the mysticism of the twentieth century this would be called *Crystal Vision* or *Crystal Gazing*. Cagliostro added to the *mise-en-scène* of the occasion by appearing in gorgeous robes. He would make mesmeric passes over the youthful clairvoyant, and summon the geniuses of the earth, air, and water, and the angels of the spheres, to enter the globe. "The seer became convulsed, she ground her teeth, and exhibited every sign of nervous excitement. At last she saw and began to speak. What was taking place that very moment hundreds of miles from Paris, in Vienna or St. Petersburg, in Austria or Pekin," etc. "It would be hard," says Count Beugnot, "to believe that such scenes could have taken place in France at the end of the eighteenth century; yet they aroused great interest among people of importance in the Court and the town."

An interesting pen portrait of Cagliostro is contained in Beugnot's memoirs. The Count met the enchanter for the first time at the house of Madame de la Motte:

"Cagliostro was of medium height, rather stout, with an olive complexion, a very short neck, round face, two large eyes on a level with the cheeks, and a broad, turned-up nose.... His hair was dressed in a way new to France, being divided into several small tresses that united behind the head, and were twisted up into what was then called a club.

"He wore on that day an iron-gray coat of French make, with gold lace, a scarlet waistcoat trimmed with broad Spanish lace, red breeches, his sword looped to the skirt of his coat, and a laced hat with a white feather, the latter a decoration still required of mountebanks, tooth-drawers and other medical practitioners, who proclaim and retail their drugs in the open air. Cagliostro set off this

costume by lace ruffles, several valuable rings, and shoe-buckles which were, it is true, of antique design, but bright enough to be taken for real diamonds.... The face, attire, and the whole man made an impression on me that I could not prevent. I listened to the talk. He spoke some sort of medley, half French and half Italian, and made many quotations which might be Arabic, but which he did not trouble himself to translate. I could not remember any more of [his conversation] than that the hero had spoken of heaven, of the stars, of the Great Secret, of Memphis, of the high-priest, of transcendental chemistry, of giants and monstrous beasts, of a city ten times as large as Paris, in the middle of Africa, where he had correspondents."

III.

Cagliostro was at the height of his fame, when suddenly he was arrested and thrown into the Bastille. He was charged with complicity in the affair of the Diamond Necklace. Here is his own account of the arrest: "On the 22d of August, 1786, a commissarie, an exempt, and eight policemen entered my home. The pillage began in my presence. They compelled me to open my secretary. Elixirs, balms, and precious liquors all became the prey of the officers who came to arrest me. I begged the commissarie to permit me to use my carriage. He refused! The agent took me by the collar. He had pistols, the stocks of which appeared from the pockets of his coat. They hustled me into the street and scandalously dragged me along the boulevard all the way to the rue Notre-Dame du-Nazareth. There a carriage appeared which I was permitted to enter to take the road to the Bastille."

What was this mysterious affair of the Diamond Necklace which led to his incarceration in a state prison? In brief the story is as follows:

The court jeweler, M. Böhmer, had in his possession a magnificent diamond necklace, valued at 1,800,000 livres originally designed for the ivory neck of the fair but frail Madame Du Barry, mistress of Louis XV. But Louis—"the well beloved"—died before the necklace was completed; the Sultana went into exile, and

the unlucky jeweler found himself with the diamond collar on his hands instead of on the neck of the Du Barry. He was obliged to dispose of it, or become a bankrupt. Twice he offered it to Marie Antoinette, but she refused to purchase it, or permit her husband, Louis XVI., to do so, alleging that France had more urgent need of war ships than jewels. Poor Böhmer, distracted at her refusal to buy the necklace, threatened to commit suicide. The matter became food for gossip among the *quid nuncs* of the Court. Unfortunate necklace, it led to one of the most romantic intrigues of history, involving in its jeweled toils a Queen, a cardinal, an adventuress, a courtesan, and a conjurer. Living at the village of Versailles at the time was the Countess de la Motte, an ex-mantua maker, and a descendant of an illegitimate scion of the Valois family, who had committed a forgery under Louis XIII. Her husband was a sort of gentleman-soldier in the gendarmerie; a gambler and a rake. Madame de la Motte-Valois, boasting of the royal blood that flowed in her veins, had many times petitioned the King to assist her. A small pension had been granted, but it was totally inadequate to supply her wants. She wished also to gain a foothold at Versailles and flutter amidst the butterfly-countesses of the *Oeil de Boeuf*. Looking about for a noble protector, some one who could advance her claims, she pitched upon the Cardinal de Rohan who was Grand Almoner of the King. He supplied her with money, but accomplished very little else for her. Though Grand Almoner and a Cardinal, Louis de Rohan was *non persona grata* at the court. He was cordially detested by Marie Antoinette not only because of his dissolute habits, but on account of slanderous letters he had written about her when she was still a Dauphiness. This coldness on the part of the Queen caused the Cardinal great anguish, as he longed to be Prime Minister, and sway the destinies of France through the Queen like a second Mazarin. More than that he loved the haughty Antoinette. All these things he confided to Madame de la Motte. When the story of Böhmer and the Diamond Necklace was noised abroad, Madame de la Motte conceived a plot of wonderful audacity. She determined to possess the priceless collar and make the Cardinal the medium of obtaining it. She de-

luded the Cardinal into the belief that she was in the Queen's confidence. She asserted that Marie Antoinette had at last yielded to her pleadings for recognition as a descendant of the Valois and granted her social interviews. She confided to him that the Queen secretly desired to be reconciled to him. She became the pretended "go-between" between the Cardinal and the Queen, and delivered numerous little notes to him, signed "Antoinette de France." Finally she arranged an interview for him, at night, in the park of Versailles, ostensibly with the Queen, but in reality with a young girl named D'Oliva who bore a remarkable resemblance to Marie Antoinette. The D'Oliva saw him only for a few moments and presented him with a rose. The Cardinal was completely duped. "Madame de la Motte persuaded him," says Greeven, "into the belief that the Queen was yearning for the necklace, but, as she could not afford it, he could assure himself of her favor by becoming security for the payment. She produced a forged instrument, which purported to have been executed by the Queen, and upon which he bound himself as security." The necklace was delivered to the Cardinal, who handed it over to Madame de la Motte, to be given to Marie Antoinette.

But, asks the curious reader, what has all this to do with Cagliostro? What part had he to play in the drama? This: When the Comtesse de la Motte was arrested, she attempted to throw the blame of the affair upon the Cardinal and Cagliostro. She alleged that they had summoned her into one of their mystic séances. "After the usual hocus-pocus, the Cardinal made over to her a casket containing the diamonds without their setting, and directed her to deliver them to her husband, with instructions to dispose of them at once in London. Upon this information Cagliostro and his wife were arrested. He was detained, without hearing, from the 22d of August, 1785, until the 30th of January, 1786, when he was first examined by the Judges, and he was not set at liberty till the 1st of June, 1786."

The trial was the most famous in the annals of the Parliament. Cagliostro and the Cardinal were acquitted with honor. The Countess de la Motte was sentenced to be exposed naked, with a

rope around her neck, in front of the Conciergerie, and to be publicly whipped and branded by the hangman with the letter V (*Voleuse—thief*) on each shoulder. She was further sentenced to life imprisonment in the prison for abandoned women. She escaped from the latter place, however, to London, where she was killed on the 23d day of August, 1791, by a fall from a window. The Count de la Motte was sentenced *in contumacium*. He was safe in London at the time and had disposed of the diamonds to various dealers. The d'Oliva was set free without punishment. The man who forged the letter for Madame de la Motte, her secretary Vil-

MADAME DE LA MOTTE'S ESCAPE. (After an English print of 1790.)

lette, was banished for life. Countess Cagliostro was honorably discharged.

The Cardinal was unquestionably innocent, as was fully established at the trial. His overweening ambition and his mad love for Marie Antoinette had rendered him an easy dupe to the machinations of the De la Mottes. But how was it with Cagliostro? The essayist Greeven, in an article published a few years ago in the *Calcutta Review*, seems to think that the alchemist was more or less mixed up in the swindle. He sums up the suspicions as follows: "*First*, his [Cagliostro's] immense influence over the Cardinal, and his intimate relations with him, render it impossible that

so gigantic a fraud could have been practiced without his knowledge. *Second*, he was in league with the Countess for the purpose of deceiving the Cardinal, in connection with the Queen." M. Frantz Funck-Brentano, in his admirable history of the Diamond Necklace, based upon documents recently discovered in Paris [page 283, Edwards's translation, Philadelphia, 1901]: "The idea of implicating Cagliostro in the intrigue had been conceived, as Georgel says, with diabolical cunning. If Jeanne de Valois had in the first instance made a direct accusation against Cardinal de Rohan, no one would have believed in it. But there was something mysterious and suspicious about Cagliostro, and it was known what influence he exercised on the mind of the Cardinal. 'The alchemist,' she suggested, 'took the necklace to pieces in order to increase by means of it the occult treasures of an unheard-of fortune.' 'To conceal his theft,' says Doillot [Madame de la Motte's lawyer], 'he ordered M. de Rohan, in virtue of the influence he had established over him, to sell some of the diamonds and to get a few of them mounted at Paris through the Countess de la Motte, and to get more considerable quantities mounted and sold in England by her husband.'.... Cagliostro had one unanswerable argument: the Cardinal had made his agreement with the jewelers on the 29th of January, 1785, and he, Cagliostro, had only arrived in Paris at nine in the evening of the 30th."

Cagliostro refuted the charges with wonderful *sang froid*. He appeared in court "proud and triumphant in his coat of green silk embroidered with gold." "Who are you? and whence do you come?" asked the attorney for the crown.

"I am an illustrious traveller," he answered bombastically. Every one present laughed.

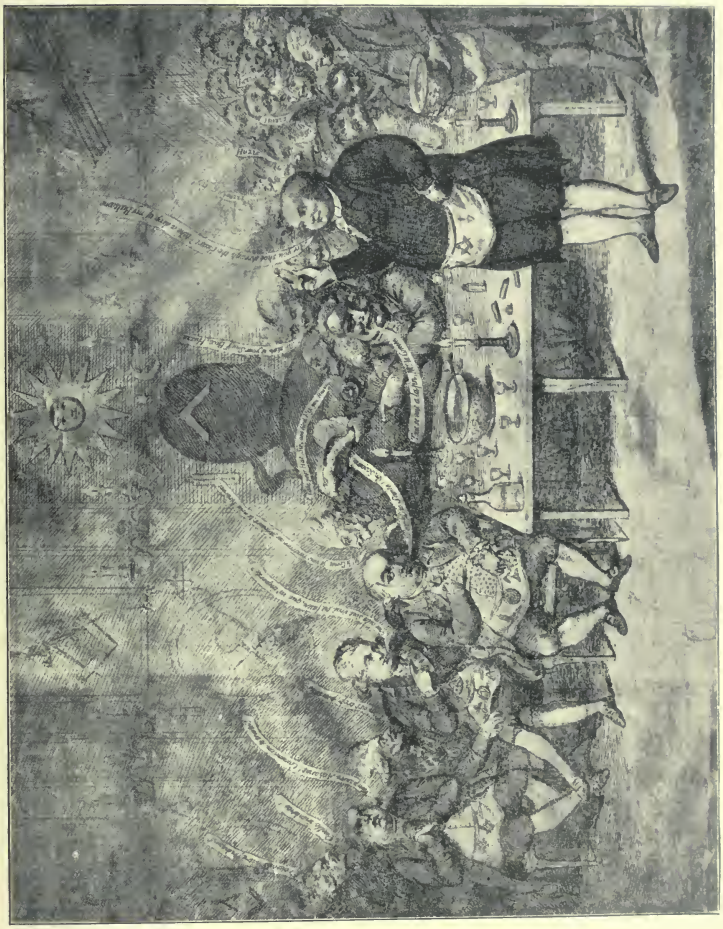
Cagliostro drove in triumph from the court house to his residence, after hearing his order of discharge. His coach was preceded by "a fantastic cripple, who distributed medicines and presents among the crowd." He found the Rue St. Claude thronged with friends and sympathisers, anxious to welcome him home. At this period revolutionary sentiments were openly vented by the people of France. The throne was being undermined by the phi-

losophers and politicians. Any excuse was made to revile Louis XVI. and his queen. Scurrilous pamphlets were published declaring that Marie Antoinette was equally guilty with the de la Mottes in the necklace swindle. Cagliostro consequently was regarded as a martyr to the liberties of man. His arrest under the detested *lettre-de-cachet*, upon mere suspicion, and long incarceration in the Bastille without trial, were indeed flagrant abuses of justice and gave his sympathisers a whip with which to lash the King and Court.

His wife had been liberated some time before him. She met him at the door of the temple of magic, and he swooned in her arms. Whether this was a genuine swoon or not, it is impossible to say, for Cagliostro was ever a *poseur* and never neglected an opportunity for theatrical effect and self-advertisement. He accused the Marquis de Launay, Governor of the Bastille—he who had his head chopped off and elevated upon a pike a few years later—of criminal misappropriation of his effects, money, medicines, alchemical powders, elixirs, etc., etc., which he valued at a high sum. The Commissioner of Police who arrested him was also included in this accusation. He appealed to his judges, who referred him to the Civil Courts. But the case never came to trial. The day after his acquittal he was banished from France by order of the King. At St. Denis, "his carriage drove between two dense and silent lines of well-wishers, while, as his vessel cleared from the port of Boulogne, five thousand persons knelt down on the shore to receive his blessing." He went direct to London. No sooner there, than he filed his suit against the Marquis de Launay, "appealing, of course, to the hearts of all Frenchmen as a lonely and hunted exile." The French Government, through its ambassador, granted him leave to come in person to Paris to prosecute his suit, assuring him of safe conduct and immunity from all prosecution, legal as well as social. But Cagliostro refused this offer, hinting that it was merely a stratagem to decoy him to Paris and reincarcerate him in a dungeon. No clear-headed, impartial person believed that the Marquis de Launay was guilty of the charge laid at his door. Whatever else he may have been, tyrannical, cold, unsympathetic, the

Governor of the Bastille was a man of honor and above committing a theft. In fact, Cagliostro's accusation was a trumped-up affair, designed to annoy and keep open "a running sore in the side of the French authorities." Notoriety is the life of charlatanry. Cagliostro was no common quack, as his history shows. He next published a pamphlet, dated June 20th, 1786, prophesying that the Bastille would be demolished and converted into a public promenade; and, that a ruler should arise in France, who should abolish *lettres de cachet* and convoke the Estates-General. In a few years the prediction was fulfilled. Poor De Launay lost his life, whereupon Cagliostro issued a pamphlet exulting over the butchery of his enemy. In London, Cagliostro became the bosom friend of the eccentric Lord George Gordon. Eventually he became deeply involved in debt, and was obliged to pawn his effects. He was unable to impress the common-sense, practical English with his pretentions to animal magnetism, transcendental medicine, and occultism. One of his vaunted schemes was to light up the streets of London with sea water, which by his magic power he proposed to change into oil. The newspapers ridiculed him, especially the *Courier de l'Europe*, published and edited by M. Morande, who had "picked up some ugly facts about the swindler's early career." The freemasons repudiated him with scorn, and would have nothing to do with his Egyptian Rite. There is a rare old print, a copy of which may be seen in the Scottish Rite Library, Washington, D. C., which depicts the unmasking of the famous imposter at the Lodge of Antiquity, published Nov. 21, 1786, at London. It was engraved by an eye-witness of the scene. In company with some French gentlemen, Cagliostro visited the Lodge one evening. At the banquet which followed the working of the degree, a certain worthy brother named Mash, an optician, was called upon to sing. Instead of a post-prandial ditty, he gave a clever imitation of a quack doctor selling nostrums, and dilating bombastically upon the virtues of his elixirs, balsams (Balsamos), and cordials. Cagliostro was not slow in perceiving that he was the target for Brother Mash's shafts of ridicule. His "front of brass," as Carlyle has it, was beaten in, his pachyderm was penetrated by the barbed arrows

of the ingenious optician's wit. He left the hall in high dudgeon, followed by the jeers of the assembled masons. Alas, for the Grand Kophta, no "vaults of steel," no masonic honors for him in London.



CAGLIOSTRO UNMASKED AT THE LODGE OF ANTIQUITY, LONDON.
From a rare print in the possession of the Supreme Council, A. A. S. R., Washington, D. C.

The verse appended to the engraving of Cagliostro and the English lodge is as follows:

"Born, God knows where, supported, God knows how,
From whom descended, difficult to know.
Lord Crop adopts him as a bosom friend,
And manly dares his character defend.

This self-dubb'd Count, some few years since became
A Brother Mason in a borrow'd name;
For names like *Semple* numerous he bears,
And Proteus like, in fifty forms appears.
'Behold in me (he says) Dame Nature's child,
'Of Soul benevolent, and Manners mild;
'In me the guiltless Acharat behold,
'Who knows the mystery of making Gold;
'A feeling heart I boast, a conscience pure,
'I boast a Balsam every ill to cure;
'My Pills and Powders, all disease remove,
'Renew your vigor, and your health improve.'
This cunning part the arch imposter acts,
And thus the weak and credulous attracts,
But now, his history is rendered clear,
The arrant hypocrite, and quack appear.
First as *Balsams*, he to paint essay'd,
But only daubing, he renounc'd the trade.
Then, as a Mountebank, abroad he stroll'd
And many a name on Death's black list enroll'd.
Three times he visited the British shore,
And every time a different name he bore.
The brave Alsatians he with ease cajol'd
By boasting of Egyptian forms of old.
The self-same trick he practis'd at Bourdeaux,
At Strasburg, Lyons, and at Paris too.
But fate for *Brother Mash* reserv'd the task
To strip the vile impostor of his mask,
May all true Masons his plain tale attend
And Satire's lash to fraud shall put an end."

To escape the harpies of the law, who threatened him with a debtor's prison, Cagliostro fled to his old hunting-ground, the Continent, leaving *la petite Comtesse* to follow him as best she could. But the game was played out. The police had by this time become fully cognisant of his impostures. He was forbidden to practise his peculiar system of medicine and masonry in Austria, Germany, Russia, and Spain. Drawn like a needle to the lodestone rock, he went to Rome. Foolish Grand Kophta! Freemasonry was a capital offence in the dominions of the Pope. One lodge, however, existed. Says Greeven: "There is reason to suppose that it was

tolerated only because it enabled the Holy Church to spy out the movements of freemasons in general." Cagliostro attempted to found one of his Egyptian lodges, but met with no success. His exchequer became depleted. He appealed to the National Assembly of France to revoke the order of banishment, on the ground of "his services to the liberty of France." Suddenly on the evening of Dec. 27, 1789, he and his wife were arrested and incarcerated in the fortress of San Angelo. His highly-prized manuscript of Egyptian masonry was seized, together with all his papers and correspondence. He was tried by the Holy Inquisition. It must have been an impressive scene—that gloomy council chamber with the cowled inquisitors. Cagliostro's wife appeared against him and lifted the veil of Isis that hid the Mysteries of the Charlatan's career. The Egyptian manuscript of unknown George Coston, the seals, the masonic regalia and paraphernalia were mute and damning evidences of his guilt. He was indeed a freemason, even though he were not an alchemist, a soothsayer, the Grand Kophta of the Pyramids. Cagliostro's line of defence was that "he had labored throughout to lead back freemasons, through the Egyptian ritual to Catholic orthodoxy." He appeared at first to be contrite. But it availed him nothing. Finding his appeals for mercy useless, he adopted another tack, and told impossible stories of his adventures. He harangued the Holy Fathers for hours, despite their threats and protests. Nothing could stop his loquacious tongue from wagging. Among other Münchausen tales, he related how he had visited the Illuminati of Frankfurt, when on his way to Strasburg. In an underground cavern, the secret Grand Master of Templars "showed him his signature under a horrible form of oath, traced in blood, and pledged him to destroy all despots, especially in Rome." Finally, he was condemned to death as a heretic, sorcerer, and freemason, but Pope Pius VI., on the 21st of March, 1791, commuted the sentence to life imprisonment. His manuscript was declared to be "superstitious, blasphemous, wicked, and heretical," and was ordered to be burnt by the common hangman, together with his masonic implements. From San Angelo, Cagliostro was conducted to the Castle of San Leon, Urbino. Here, in

a subterranean dungeon, he fretted away his life in silence and darkness, until 1795, when he died. A French inspector of Italian prisons, who visited the fortress of San Leon, March 6, 1795, reported that he saw a sentence and autograph scribbled upon the dungeon wall by Cagliostro. No one knows where the arch-enchanter is buried. His wife ended her days in a convent.

In the Inquisition biography some curious letters to Cagliostro from his masonic correspondents in France are published. They evidence the profound respect, one might almost say blind worship, with which he was regarded by his disciples.

The masonic lodge at Rome was disrupted shortly after Cagliostro's arrest. The Sbirri of the Holy Office pounced down upon it, but the birds had flown, taking with them their most important papers. Father Marcellus says that among the members of this Roman lodge were an Englishman and an American.

And so endeth the career of Cagliostro, one of the most romantic of history. His condemnation as a sorcerer and freemason has invested him with "the halo of a religious martyr, of which perhaps no one was less deserving."

Among his effects was found a peculiar seal, upon which were engraved the mysterious letters "L. P. D." These letters are supposed to stand for the Latin sentence, "*Lilia pedibus destrue*," which translated signifies: "Tread the lilies under foot,"—alluding to the overthrow of the French monarchy.

Many theosophical writers have placed implicit belief in the mission of Cagliostro as the secret agent of an occult brotherhood working for human liberty and regeneration.

Taking this idea for a theme, Alexander the Great—he of the pen, not of the sword—has built up a series of improbable though highly romantic novels about the personality of Cagliostro, entitled *The Memoirs of a Physician*, and *The Diamond Necklace*. He makes him the Grand Kophta of a society of Illuminati, or exalted Freemasons, which extends throughout the world. Pledged to the spread of equality, fraternity, and liberty among men, the Brotherhood seeks to overthrow the thrones of Europe, symbols of oppression and persecution. The *Memoirs of a Physician* opens with a re-

markable prologue, descriptive of a solemn conclave of the secret superiors of the Order. The meeting takes place at night in a ruined chateau located in a mountainous region near the old city of Strasburg. Cagliostro reveals his identity as the Arch-master of the Fraternity, the Grand Kophta, who is in possession of the secrets of the pyramids. He takes upon himself the important task of "treading the lilies under foot" and bringing about the destruction of the monarchy in France, the storm-centre of Europe. He departs on his mission. Like Torrini, the conjurer, he has a miniature house on wheels drawn by two Flemish horses. One part of the vehicle is fitted up as an alchemical laboratory, wherein the sage Althotas makes researches for the elixir of life. Arriving at the chateau of a nobleman of the *ancien régime*, Cagliostro magnetises a young lady and causes her to see in a carafe of water the death of Louis XVI. and Marie Antoinette by the guillotine. Aided by the freemasons of Paris, Cagliostro sets to work to encompass the ruin of the throne and to bring on the great Revolution. Dumas in this remarkable series of novels passes in review before us Jean Jacques Rousseau, Cardinal de Rohan, Louis XV. and XVI., Marie Antoinette, Comtesse du Barry, Madame de la Motte, Danton, Marat, and a host of people famous in the annals of history. Cagliostro is exalted from a charlatan into an apostle of liberty endowed with many noble qualities. He is represented as possessing occult powers, and his séances are depicted as realities. Dumas himself was a firm believer in spiritualism, and hobnobbed with the American medium Daniel D. Home.

Cagliostro's house in the Marais quarter, Paris, still remains—a memorial in stone of its former master. In the summer of 1899 the *Courier des États Unis*, New York, contained an interesting article on this mansion. I quote as follows:

"Cagliostro's house still stands in Paris. Few alterations have been made in it since the days of its glories and mysteries; and one may easily imagine the effect which it produced in the night upon those who gazed upon its strange pavilions and wide terraces when the lurid lights of the alchemist's furnaces streamed through the outer window blinds. The building preserves its noble lines in spite of modern additions and at the same time has a weird appearance which produces an almost depressing effect. But this doubtless comes from the imagination, be-

cause the house was not built by Cagliostro; he simply rented it. When he took up his quarters in it, it was the property of the Marquise d'Orvillers. Cagliostro made no changes in it, except perhaps a few temporary interior additions for the machines which he used in his séances in magic.

"The plan of the building may well be said to be abnormal. The outer gate opens upon the rue Saint Claude at the angle of the boulevard Beaumarchais. The courtyard has a morose and solemn aspect. At the end under a flagged porch there is a stone staircase worn by time, but it still preserves its old iron railing. On looking at that staircase, one cannot help thinking of the hosts of beautiful women, attracted by curiosity to the den of the sorcerer, and terrified at what they

Courtyard of Cagliostro's House in Paris (Present Condition).

imagined they were about to see, who placed their trembling hands upon that old railing. Here we can evoke the shade of Mme. de la Motte running up the steps, with her head covered with a cloak, and the ghosts of the valets of Cardinal de Rohan sleeping in the driver's seat of the carriage with a lantern at their feet, while their master, in company with the Great Kophta, is occupied with necromancy, metallurgy, cabala, or oneirocritics, which, as everybody knows, constitute the four elementary divisions of Cagliostro's art.

"A secret stairway now walled up ran near the large one to the second story, where its traces are found; and a third stairway, narrow and tortuous, still exists at the other end of the building on the boulevard side. It is in the center of the

wall, in complete darkness, and leads to the old salons now cut into apartments, the windows of which look out upon a terrace. Below, with their mouldering doors, are the carriage house and the stable,—the stable of Djérid, the splendid black horse of Lorenza Feliciani."

To verify the above statement, I wrote to M. Alfred de Ricaudy (an authority on archæological matters and editor of *L'Echo du Public*, Paris), who responded as follows, Jan. 13, 1900:

"The house still exists just as it was in the time of Cagliostro [the exterior]. Upon the boulevard, contiguous to the mansion, there was formerly the shop of one Camerlingue, a bookseller, now occupied by an upholsterer. On January 30, 1789, Cagliostro took up his residence in this quaint old house. It was then No. 30 Rue St. Claude, at the corner of the Boulevard Saint Antoine, afterwards the Boulevard Beaumarchais. The Marquise d'Orvillers was the owner of the premises occupied by the thaumaturgist of the eighteenth century. Her father, M. de Chavigny, captain in the royal navy, had built this house on ground acquired in 1719 from Mme. de Harlay, who had inherited it from her father, le Chevalier Boucherat. (See Lefeuve, *Old House of Paris*, Vol. IV., issue 51, page 24, published by Achille Faure, Paris, 1863.)"

Cagliostro's house is now No. 1, the numbering of the street having been altered during the reign of Louis Philippe. Says M. de Ricaudy:

"The numbering originally began at the Rue Saint Louis, now Rue de Turenne, in which is situated the church Saint Dennis du St. Sacrement. When the houses were re-numbered with reference to the direction of the current of the Seine (under Louis Philippe), the numbers of the Rue St. Claude, which is parallel to the river, began at the corner of the boulevard, and in that way the former number 30 became number 1."

The sombre old mansion has had a peculiar history. Cagliostro locked the doors of the laboratories and séance-rooms on the 13th of June, 1788, on the occasion of his exile from France. All during the great Revolution the house remained closed and intact. Eighteen years of undisturbed repose passed away. The dust settled thick upon everything; spiders built their webs upon the gilded ceilings of the salons. Finally, in the Napoleonic year 1810, the doors of the temple of magic and mystery were unfastened, and the furniture and rare curios, the retorts and crucibles, belonging to the dead conjurer were auctioned off. An idle crowd of curious *quid nuncs* gathered to witness the sale, and pry about. Says Ricaudy:

"The household furniture, belongings, etc., of the illustrious adventurer were not sold until five years after his death. The sale took place in the apartment which he had occupied, and was by order of the municipal government. An examination revealed many curious acoustical and optical arrangements constructed in the building by Cagliostro. By the aid of these contrivances and that of well-trained confederates, he perpetrated many supposedly magical effects, summoned the shades of the dead," etc. (See *Dictionnaire de la France.* By A. G. de St. Fargeau, Vol. III., page 245. Paris, 1851.)

The writer of the article in the *Courier des États Unis* further states:

"Since the auctioning of Cagliostro's effects the gloomy house of the Rue St. Claude has had no history. Ah, but I am mistaken. In 1855 some repairs were made. The old carriage door was removed, and the one that took its place was taken from the ruins of the Temple. There it stands to-day with its great bolts and immense locks. The door of the prison of Louis XVI. closes the house of Cagliostro."

M. de Ricaudy verifies this statement about the door of the mansion. The student of Parisian archæology will do well to consult M. de Ricaudy, as well as M. Labreton, 93 Boulevard Beaumarchais, who possesses forty volumes relating to the history of the Marais Quarter. Last but not least is the indefatigable student of ancient landmarks of Paris, M. G. Lenôtre, author of *Paris révolutionaire, vieilles maisons, vieux papiers.*

My friend, M. Félicien Trewey, who visited the place in the summer of 1901, at my request reported to me that it had been converted into a commercial establishment. A grocer, a feather curler, and a manufacturer of cardboard boxes occupied the building, oblivious of the fact that the world-renowned Cagliostro once lived there, plying his trade of sorcerer, mesmerist, physician, and mason, like a true *chevalier d'industrie.* Alas! the history of these old houses! They have their days of splendid prosperity, followed by shabby gentility and finally by sordid decay,—battered, blear-eyed, and repulsive-looking.

Henry Ridgely Evans.

Washington, D. C.

PHILOSOPHY IN ITALY.

ITALIAN philosophy is very little known, even in Italy. No complete history of it exists, and one is compelled to resort for information concerning it to sketches of particular periods or to monographs on schools and individuals.

The reason of this neglect is to be sought mainly in the psychological constitution of our race. The Italians are not, like the Germans, a nation of thinkers; as a rule they lack the taste for general abstractions and ideas, which is the primal source of philosophy. The two salient aspects of their activity, particularly if we review their past, are practical life and art. They love action; they have produced successful merchants, adventurous travellers, statesmen and warriors; they love reality; they have had a brilliant succession of scientists and inquirers; they love beauty; and they boast of the greatest artists the world has produced. Adding to this their love of tradition and of their past, which has produced long generations of historians and scholars, and at times a hyperæsthesia of the religious sentiment, we have a pretty complete picture of the tendencies of the Italian mind. Love of pure thought, of abstraction, and of generalisation is absent, at least in the great majority of cases.

Yet, despite this inaptitude for speculative thinking, Italy has had some very distinguished philosophers,—a fact which is not in contradiction with what I have just laid down. The great philosophers of Italy appeared spasmodically (for example, Bruno, Vico); they possessed in a high degree the qualities of observation of their race (for example, Galileo); sometimes they drew their inspiration from foreign philosophers (for example, Rosmini and Gioberti).

Many of them were compelled to leave their native country in search of a clime more favorable to abstract thought, and even to this day there are some who are more studied abroad than at home.

To the psychological causes of the lack of speculation in Italy are to be added two historical causes: (1) The perpetual dismemberment of Italy, which never permitted the formation of a single center of culture; and (2) the presence of the Catholic Church.

But the first consideration has not much weight, since we have had in Italy centers for law (Bologna), for medicine (Salerno, Pisa), for natural sciences (Padua); and nothing should have prevented the formation of a real center of philosophy, whereas in fact we have only had transitory groups (Padua, Florence, Naples). And one could also advert to the fact that the political dismemberment of Germany, although greater than that of Italy, did not prevent the development of a Leibnitz and a Kant.

The influence of the Roman Church has been more powerful, and, as it would seem, more pernicious. It is true, at the beginning of the Renaissance, Rome was comparatively tolerant and permitted philosophers to carry on their discussions without greatly molesting them. It was not until after the Reformation that the popes drew the bonds tighter and began their persecutions. With the seventeenth century the counter-reformation triumphed in Italy and original speculation almost entirely vanished. This is a coincidence that has impressed historians who like to see in the suppression of the Reformation in Italy almost the sole cause of the decline of speculative thought. Doubtless this was an important factor, and it is to be remembered that in the Teutonic countries the Reformation induced habits of intellectual liberty which have exercised a most beneficent influence on the progress of thought. But the psychological causes, which go deeper, must also not be forgotten. If Italy did not embrace the Reformation, her action was not solely due to the great power of the Church. Attempts to establish it were not wanting, and recently M. Ruffini has shown that the principle of religious liberty was carried to the North by Ital-

ians,—Socinians. But the mass of the people was not a favorable medium for the new ideas.

The people of Italy take, we must admit, little interest in things of the intellect; it is practical, and the Church is a source of gain and of employment for it. It is artistic, and it has no mind to renounce the pomps of the Church, the paintings of Raphael, and the sculptures of Michael Angelo. Its concern is with outward things, and it troubles itself little about intellectual freedom. It is on occasions a trifle sluggish, and has no desire to torture its brain with the Holy Scriptures.

The suppression of the Reform was therefore an effect, and not a first cause. Italy has not had a national philosophy for the reason that its inhabitants are no lovers of general ideas. This explanation, which may recall that of M. de la Palisse, is nevertheless the most ultimate one that can be given, because it is derived from ultimate psychological elements. Thus is explained the want of connection and sequence in the Italian Systems, much as we should like to find it. An ingenious positivist writer, M. Puglia, concludes naturally enough that the character of Italian philosophy is positivistic, just as others have shown that it is religious or idealistic in character.

We must repeat that the philosophy of Italy as a continuous and organic production does not exist; we can speak only of philosophers who were born in Italy and have written in Italian,—nothing more. The philosophical groups—the Averroism of Padua, the Platonism of Florence, the Hegelianism of Naples—did not long endure and were the fruits of importation.

Nevertheless, the history of philosophy in Italy is very interesting, and it is to be regretted that it has not been more cultivated. If to-day Italy is not one of the three great centres of philosophy (themselves not at present extraordinarily brilliant), it has been so in the past and was alone so during two centuries, the fifteenth and the sixteenth; and it is to be borne in mind that one of the greatest movements of modern thought, Experimentalism, was established and developed in Italy before appearing in any other country.

The political unification of Italy (1860–1870) imparted a new impetus to the study of the sciences, and it would seem from certain indications that philosophy is also gaining in esteem among the educated Italians who are now coming more and more in contact with foreign influence. We shall learn in a forthcoming paper to what extent this is true, while in the present we shall endeavor to trace the development of Italian philosophy to the time of the proclamation of our national unity (1870), seeing whether it corroborates our introductory remarks.

I.

THE MIDDLE AGES (V.–XIV. CENTURIES).[1]

How did Italian philosophy begin? This is a question that has been long debated and which still awaits solution. Some writers would have it commence with the first philosophers of Magna Græcia, with the Pythagoreans (Bartholmess, Poli, and Puglia); others with Boetius and the Middle Ages (Siciliani), or with the Renaissance (Fiorentino).

We shall dismiss classical antiquity altogether. The philosophical schools of southern Italy are intimately connected with the development of Greek thought, and there is only a geographical reason for separating them. The Romans, we know, had no original philosophy. They merely echoed Greek thought with more or less fidelity. We find them Epicurean with Lucretius, Stoical with Seneca and Marcus Aurelius, and Eclectic with Cicero, —never Italian or Roman. They left us in their works valuable sources of knowledge for the ancient philosophy, but they never enriched human thought with a single new idea. They were excellent soldiers, skilful administrators, but very mediocre thinkers. M. Puglia is of the opinion that the real philosophy of the Romans was their jurisprudence, but this cannot, I think, be classified without violence as a branch of speculation properly so called, and is

[1] General sketches: B. Poli, *Filosofi italiani* (supplement to the Italian trans. of Tennemann, Milan, 1836 and 1855); F. Bertinaria, *Dell'indole e delle vicende della filos. ital.*, Turin, 1846; Predari, *Carattere e sviluppo della filos. ital.* (*Saggi di Critica*, Naples); F. Puglia, *L'evoluz. nella storia dei sistemi filosofici italiani* (*Archiv f. Gesch. d. Philos.*, 1888, B. I., Heft 2), new edition, Naples, 1890.

on the contrary rather a new proof of the practical and therefore anti-speculative tendencies of the ancient masters of the world.

Nevertheless, I should not place the beginnings of Italian philosophy in the Middle Ages, at least not in the late Middle Ages. Italy, like all other countries of the Occident, suffered two invasions: the spiritual Christian invasion of the Orient and the human barbarous invasion of the North. After five centuries (the 1st to the 5th), it ceased to be a sovereign pagan country. Slowly the ancient culture disappeared. Boetius (470–524) and Cassiodorus (480–575) are pious Christians who still know the ancient philosophies; but after them comes the darkness of night. Rome is no longer the capital of the world, and the new Italian nationality has not yet formed. Greek philosophy is buried and unknown, and Christian philosophy is still in its swaddling clothes. It is a long period of transition during which the invasions cease, a new society is formed, the races intermingle and fuse, the Church is organised, a profound faith produces hymns and heresies, but no explanations or rebellions. There is as yet no need of justifying the dogmas. The energies of teachers were restricted to expounding them, or at most to defending them against heterodox doctrines. There are a few moralists,—Gregory the Great who died in 604, Acton (10th century), or some theologians,—Peter of Pisa, Paolino of Aquileia (8th century); but we find nothing that could justly be called philosophy.

The formation of the Italian nationality occupies about four centuries (the 9th to the 11th). We have the first Italian kings in the 9th century, the first independent communes in the 11th century, and their struggles, sometimes successful, with the German emperors from the 11th to the 13th centuries. The language, that powerful badge of nationality, dropped its Latin form and became the *volgare italiano*, of which we have traces from the 9th century, and which soon took firmer shape from the literary compositions of the 12th and 13th centuries. Here we may begin to speak of Italian philosophy. But from the conditions of the time this philosophy was essentially European.

The remark has been made by Brunetière and others that lit

erature presents during the Middle Ages a far greater homogeneity than in more recent epochs. The national impress is almost entirely wanting. The same contention could be made with respect to philosophy. The aim, the faith, the language, and the mental habits were almost everywhere the same; we can no more talk of an Italian philosophy than of a French or a German.

The origins of this European philosophy are fairly well known. Faith weakened and doubts grew rife; whilst the ancient disputes waxed more prominent. The necessity arose of demonstrating, explaining, and unifying the dogmas with the aid of reason: hence scholasticism. The Church, which was mostly concerned with this work of justification, had its seat in Italy, and loved to recruit its dignitaries from the Italian people; and it was therefore not strange to see many men of Italian nationality in the ranks of the pioneers.

If scholasticism took its origin in Ireland with Scotus Erigena (9th century), it took shape with Lanfranc of Pavia (1005–1089), St. Anselm (1033–1078), Peter Lombard (died in 1160), and reached its apogee with St. Thomas Aquinas (1227–1274),—all of whom were Italians. I shall not give a synopsis of their ideas, for they are well known from the general histories of philosophy, and besides they belong rather to the history of religion. I shall restrict myself to signalising certain general characteristics which we meet within the Italian civilisation of the Middle Ages.

As we have seen, scholasticism is an international philosophy to which Italians have contributed much. But these rich contributions should not lead us astray regarding the true character of Italian demopsychology, for there are certain facts that show that pure speculation was not one of the habits and tastes of the inhabitants of the peninsula. These facts are:

1. The emigration of Italian philosophers;
2. The absence of an Italian scholastic center;
3. Mysticism, opposed to science and philosophy;
4. The skeptical and Epicurean tendency of the cultivated classes;
5. The attempt to give literary (artistic) form to philosophical thought.

Whilst abroad the universities of Paris and Cologne were thronged with professors of philosophy, theology, and logic, the Italian universities possessed only a few chairs of theology; and during the entire 13th century Bologna could show but eight philosophers and Padua five. The greatest lights of scholasticism,—St. Thomas Aquinas, Peter Lombard, and St. Bonaventura,—were compelled to study and to teach beyond the Alps.

The Umbrian mystical movement from about the 12th to the 13th centuries, which spread to the north and the south and which had its apostle in St. Francis of Assisi (1181–1226), its philosopher in St. Bonaventura (1221–1274), and its poet in Fra Jacopo da Todi (1230–1306), is outspokenly hostile to science and dialectics. The simple faith and sentimental contemplation of this mysticism are a distinct reaction against the logical spirit of scholasticism.

In the higher classes another current is noticeable,—the sceptical heterodox current which is represented by the poets. Here may be classed the Emperor Frederick II. (1194–1250); his son Manfred (1232–1266); his minister Pietro delle Vigne (died 1249); the Florentine poet Guido Cavalcante (1251?–1300), the physician Pietro d'Abano (1250–1316);—who sought to disentangle the philosophy of nature from religious dogmas, and like Roger Bacon was accused of practicing magic. The two first named had the works of the Arabs and of Aristotle translated, and antagonised the Church. Guido Cavalcante discussed the question of the existence of God; Pietro d'Abano translated the works of Ibn Ezra; a wandering clergy revived the cult of nature, of love, and of life; and even a cardinal, Ottaviano Degli Ubaldini (died 1273), went so far as to doubt the existence of the soul.

The pious contemporaries did not look with favor upon these skeptical and Epicurean thinkers, and Dante consigned some of these thinkers to the sombre depths of his Inferno. But this scepticism exists rather in the air than in the form of a definite system; thinking people wish to be free, to live at their ease, and have less of religion and religious institutions; but no one ever seriously thought of establishing a doctrine. They sought to criticise the

Church, which had grown too rigorous and exacting; but they were careful not to indulge in metaphysical speculations.

But the Italians are not only mystical and skeptical; they began also to be artistic and æsthetic. Italian poetry is created (13th century), and soon ceased to imitate the lyric poetry of the Provence. At Bologna and at Florence arose what is called the school of the *dolce stil nuovo* (the sweet new style), to which belonged Guido Guinizzelli (died 1276), Guido Cavalcante (1251?–1300), and Dante Alighieri (1265–1321). One of the distinguished characteristics of this school was to give poetic form to philosophical ideas. Dante went farther than his associates, and in his *Divina Comedia* he created a poetical encyclopædia of the historical and moral world of the Middle Ages, with the philosophy of St. Thomas Aquinas playing the chief rôle. The Italian genius which aspired for beauty sought to give æsthetic form even to the syllogisms of scholasticism.

But with Dante, who celebrated the last triumph of the Middle Ages, we approach the Renaissance. After him two men equally famous, Francesco Petrarch (1304–1374) and Giovanni Bocaccio (1313–1375), the first of whom is a mystical antagonist of Aristotle and the second an Epicurean little concerned with ideas, unearthed a new world which was to shatter the idols of the Middle Ages and give birth to the new thought.

II.

THE RENAISSANCE (XV.–XVII. CENTURIES).[1]

The Renaissance is the age of movement and of life, and therefore is necessarily the age of confusion. The age of awakening and resurrection is always the age of reminiscence and of discovery: unity and coherence are wanting to it. This condition of things is reflected in philosophy. The thinkers rebelled against the ancient

[1] For the Italian philosophy of the Renaissance see the following works: Manriani, *Rinnovamento dell' antica filos. italiana*; Spaventa, Fiorentino, *Il risorgimento filosofico del 1400*, Naples, 1885; and the studies of D. Berti, L. Ferri, and F. Tocco on Bruno, Campanella, Pomponazzo, Cremonini, Galileo, etc. See also J. Owen, *The Skeptics of the Italian Renaissance*, London, 1893.

ideas, but they retained the old habits and forms of thought: they sought to find the new, and reverted to the old. There were outreachings toward new horizons, but there were also backslidings to the old, and many inherent oppositions to be overcome. The philosophical works of this period reflect the groping agitations of amorphous conditions of mind, and no precise classification is possible. Survivals are distinguishable in the chaos (Thomists and Mystics); revivals (Platonism and Epicureanism); revolts (against scholasticism and Aristotle); and new tendencies (experimentalism). In the better known Italian philosophers like Bruno and Campanella there is a little of all of these: the *débris* of the Middle Ages, classical lumber, and foreshadowings of the future.

The philosophical production of Italy in this period is very great, and Italians are prone to regard the Renaissance as the Golden Age of Italian thought. The reasons for this fact are manifold: greater intellectual activity in all branches of knowledge, extensive knowledge of the classical civilisation, which was impregnated with philosophy, and an intellectual liberty which prevailed after the downfall of the Middle Ages and prior to the Reformation. But quantity is not always a criterion of quality, and discrimination must be exercised. For example, to start with, I would not include in the category of philosophy the numerous moral treatises, like those of Poggio or of Platina, which are nothing but colorless reproductions in elegant Latin of the works of antiquity; and I likewise discard the long philosophical poems, which say nothing worth recording and which are tiresome intellectual feats, and not works of genuine mental effort. And I also intentionally neglect the antiquated scholastic writers who from the retreats of their silent cloisters and the chairs of the old universities have continued even to our day to unwind their subtle syllogisms. I am also compelled to omit the political thinkers who were produced in abundance during the Renaissance and who count among them a Machiavelli (1469–1527), but who lie without the province of philosophical speculations. We are concerned solely with the thinkers who have really influenced the thought of Italy and of the world by their criticism of the narrow conceptions of peripatetic scholas-

ticism and their contributions to the creation of a philosophical method.

One of the important forms of opposition to Aristotle was the Florentine Neo-Platonism. The rôle of the Byzantine Greeks in the Renaissance has been exaggerated, but in the introduction of Plato into Italy their influence was real. It is true, Petrarch had already opposed Plato to Aristotle, and he possessed many Platonic dialogues translated into Latin; but the creation of a Platonic school was the work of a Greek, Georgius Gemistus Plethon (1355–1450); and it is certain that the famous controversy of the Greeks (1439–1471) regarding the superiority of Plato or Aristotle contributed to disseminate in Italy a taste for the great idealist. The founder of the Platonic Academy in Florence, Georgius Gemistus, is the restorer in the West of the Alexandrian eclecticism, partly Oriental and partly Grecian, learned without criticism and mystical without dogmas. His disciple and successor, Marsilio Ficino (1433–1499), who was the true master of the school, mingled the ideas of Zoroaster, Plato, and Plotinus; but Plato remained the deity of the school, and it is said that Marsilio kept a lamp perpetually burning before the image of the great philosopher. The Florentine group was quite numerous, and counted among its members several celebrities, like the famous humanist and poet Angelo Poliziano (1454–1494), Giovanni Pico della Mirandola (1463–1494), an encyclopædic scholar and a devotee of occultism; Cardinal Giacomo Sadoleto (1477–1547), an unrivalled Latinist; and lastly, the two protectors of the Academy, Cosimo and Lorenzo de Medici.[1] Later the Academy dissolved, but Platonism remained with the philosophers, especially with the men of letters. It would appear that Tuscany was a favorable center for the idealistic philosophy, for as late as the 17th century Cardinal Leopoldo de'Medici founded a new Platonic Academy and a second group of Florentine Platonists flourished, of whom the best-known is Orazio Rucellai (1604–1674).[2]

[1] Regarding the Platonic Academy, see A. Della Torre, *Storia dell'Accademia Platonica di Firenze*, Florence, 1902.

[2] See A. Alfani, *Della vita e degli scritti di Orazio Rucellai*, Florence, 1872.

Another philosophical renaissance, to which a well-known modern Italian philosopher, G. Trezza, has attributed great importance, is Epicureanism. For him the real significance of the Renaissance was the return to Epicurus as the philosopher of the scientific conception of the world and the Hedonistic conception of life, following upon the oppressive "discontinuity" of the Middle Ages. This is the truth, but not all of the truth. The Epicureanism of the Italian Renaissance is real, but it was rather in the life than in the thought of the nation, which preferred to be Epicurean in practice to writing theoretical works on Epicurean science. One of the most famous representatives of Epicureanism is Lorenzo Valla (1405–1457), author of the work *De voluptate*, and M. Gabotto, who has studied the subject and finds traces of its influence in Marsilio Ficino.

The revival of the ancient systems naturally resulted in criticisms of the philosophy of the age just passed, and the adversaries of scholasticism were many. We find them among the Platonists (Poliziano and Sadoleto) as well as among the Epicureans (Valla). Even Aristotelians are found in their ranks. Ermolao Barbaro (1454–1494), the translator of Aristotle, called Albertus and St. Thomas "*barbari philosophi.*"[1] The blows directed against scholasticism thus also struck the Aristotelian doctrine, which in part was at the basis of it. But Aristotle remained nevertheless the philosophical master of the Renaissance.

The Aristotelians of all ranks constituted a real army, and they continued to flourish until the 18th century. There are the old Aristotelians who followed the Arabian commentators (Averroes), such as Nicoletto Della Vernia (died 1499), A. Achillini (1463–1512), A. Nifo (1473–1546), Zimara (died 1532), Cesalpino (1519–1603).[2] There are those who followed the commentator Alexander of Aphrodisias, such as Pomponazzi (1462–1525), S. Porzio (died

[1] Other anti-scholastics are : Leonardo Aretino, Filelfo, Nizolio, Aconzio.

[2] For information on the school of Padua, which was the stronghold of Averroism, see E. Renan, *Averroes et l'Averroisme*, 2nd edition, Paris, M. Levy, 1861, pages 322–434 ; Mabilleau, *Étude hist. sur la phil. de la Renais. en Italie*, C. Cremonini, Paris, 1881.

1555), Scaligero (1484–1559), Zabarella (1532–1589), Cremonini (1552–1631); while there are others that adhered closely to the Greek texts, now finally made known, as Ermolao Barbaro (1454–1493), Leonico Tomeo (1456–1531), etc. Some of these restrict themselves to expositions and commentaries and have added nothing new to philosophy; some of them continued to develop the Peripatetic doctrine, while others criticised it or differed from it in certain points.

But the number of those who rejected Aristotle altogether is very small, and even Galileo, who is held up to us as the symbol of Italian anti-Aristotelianism, professed genuine esteem and admiration for the master of Stagira. The best-known names of Italy are found among the Aristotelians: Pomponazzi, Nifo, Contarini, Leonico Tomeo, Vanini, Cremonini, Piccolomini, Achillini, Cesalpino, Zabarella, etc.

Some of these are very important. Pomponazzi (1462–1525), for example, had bold ideas, and derived from Aristotle's philosophy doctrines which spoke unmistakably of the new times. He affirmed the immortality of the soul, the relativity of knowledge, the naturalness of phenomena; he rejected miracles, denied free will, and stood for experience and universal determinism. But he derived many dangerous things from Aristotle, and, despite his reticence in Church matters, his book *De immortalitate animæ* (1534)[1] was publicly burned.

P. Icilio Vanini (1585–1619) was perhaps a disciple of Pomponazzi and advanced still bolder ideas. He departed widely from Aristotle, professed an irreligious, cosmological materialism which he cloaked with irony, and had flashes of genius, as is proved by his ideas on animal evolution and on the influence of environment on the characters of men. This time they were not content to burn the books of the philosopher, but burned the unfortunate man himself, at Toulouse.[2]

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[1] See L. Ferri, *Pomponazzi e la Rinascenza*, Florence, 1872.

[2] V. Cousin, *Fragments philosophiques*, Mod. I., pp. 1–99; R. Palumbo *G. C. Vanini e i suoi tempi*, Naples, 1878; N. di Cagno-Politi, *G. C. Vanini*, Rome, 1894.

But it would take too long to examine everything that the disciples of Aristotle have added to the doctrines of the master, and we shall pass on to those who have had greater aspirations of originality. But these aspirations were not always satisfied, and I shall cite for example Francesco Patrizi (1527–1597), who in his work *Nova de universis philosophia* (1591) claimed to have created a new philosophy, which was in effect only a confused congeries, formed of Platonic theories, of ideas attributed to Hermes and Orpheus, and of garbled doctrines of Zoroaster, Parmenides, and Telesio.

Two philosophers only of this period reached anything like originality and produced ideas which entered into the composition of European thought: they were Giordano Bruno and Tommaso Campanella.

It is not an easy task to speak of Bruno (1548-1600) after the numerous studies which have been devoted to him in all countries.[1] He is without doubt the best known, most widely discussed, and most variously interpreted philosopher of Italy. To Bartholmess, he is a pantheist and a precursor of Spinoza and Hegel; to Clemens and Carrière, he is an atheist; to Brunnhofer and Morselli, he is a monist and a Darwinian. But after the learned and profound analysis which M. Tocco has made of his Latin works, I accept this writer's theory of the three phases of Bruno's thought.[2]

Bruno was first a simple Neo-Platonist; afterwards he leaned toward Parmenides and Heraclitus, and the third and last stage of his evolution carried him as far as Democritus, the atoms of whom he conceived as endowed with a common and single spiritual energy (*monadi*), thus anticipating in many respects the monadology of Leibnitz. But at bottom his philosophy is essentially monistic and

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[1] See the studies of Berti, Bovio, Brambilla, Ferrari, Di Giovanni, Levi, Mariano, Martinis, Maturi, Morselli, Pellizzari, Pognisi, Previti, Schiattarella, Stiavelli, Tocco, Graziano, Troilo, Fiorentino, Spaventa, etc. (for Italy); Saisset, Cousin, Debs, Vacherot, Bouillier, Desdouits, Marc Monnier, etc. (for France); Bender, Beyersdorff, Kuhlenbeck, Ritter, Landseck, Riehl, Thikötter, etc. (for Germany); Frith, Owen, Davidson, etc. (for England and America). The best biography is that of Berti, Turin, 1868, 1889.

[2] G. Tocco, *Le opere latine di G. Bruno*, Florence, 1889; id. *Le opere in edite di G. Bruno*, Naples, 1891.

naturalistic; in physics he boldly combats the natural philosophy of Aristotle, and surmises the homogeneity of the terrestrial and celestial bodies. In psychology he had a very clear idea of the laws of association; in cosmology he was the first to base his hypotheses on the new heliocentric theories; in philosophy, finally, he was the first to proclaim "philosophical liberty," of which he was the expression and for which he perished in the flames. His works abound in contradictions, incertitudes, and even in naïve and ridiculous ideas; but he possessed a truly grandiose vision of the universe and he had with respect to its structure intuitions which modern science has only corroborated and rendered more precise. His philosophy is dominated by the idea of the infinite; the infinite is space, the infinite is the universe, which he identifies with God, who is its soul. For the prime mover of Aristotle, for the creator of the scholastics, he substituted the Eternal, natural causality, the *natura naturans*, which is always becoming and which finds its explanation in the *natura naturata* and remains always one and the same. Nothing is born, nothing perishes; whatever is, is transferred and reproduced. "Synthesis of monism and of atomism, of idealism and of materialism, of speculation and of observation, it is the common stock from which modern ontological doctrines have emanated" (Weber). If we add that it has influenced Bacon, Spinoza, Malebranche, Leibnitz, Diderot, Jacobi, Schelling, and Hegel, it will be admitted that its importance has in no wise been exaggerated, and I regret that space prevents me from saying more about him.

Although less known, Tommaso Campanella (1568–1639) is not less important. He is not only a metaphysician; he is also an epistemologist. Just as he had projects for political and social regeneration, so likewise he aspired to reform knowledge (*Disputatio in prologum instauratarum scientiarum*) and philosophy (*Philosophiae universalis*,[1] 1638). He is hostile to the ancient metaphys-

[1] For the biography of Campanella see the works of M. Amabile (1882, 1890, and 1895). For his philosophical theories, see the studies of D'Ancona, Spaventa, Ferrari, Berti, Fiorentino, Sanesi; and G. Sante Felici, *Le dottrine filosofico-religiose di T. Campanella*, Lanciano, 1895.

ics, and esteems highly the experimental movement, though seeking in all essential respects to preserve the theological edifice of Christianity. This leads him to reject the pure naturalism of Bruno, to accept a species of Neo-Platonic transcendentalism, and to indulge in dreams concerning the political supremacy of the Roman Church. His greatest originality is shown in his theory of knowledge, which is developed at length in his *De optimo genere philosophandi.* He expounds the doubts advanced by the sceptics, and even appears himself to be slightly inclined in this direction, at least so far as the doctrines of others are concerned; for he writes: "Follow no sect of philosophers, and do not imagine that they are free from error, for everybody is a liar or some way in error through either ignorance, wickedness, or fear. God alone is the truth" (Art. 11). At bottom he is openly a sensationalist: *Sentire est sapere.* He is perfectly clear on this point, although he gives the word *sentire* a broader meaning than do the pure sensationalists of the 18th century. But his sensationalism does not culminate in idealism or in scepticism, for he appeals to the internal sense, viz., reason, to effect the passage from sensation to the outward world, maintaining that we can reach the notion of the non-ego directly. But God alone really knows the non-ego, the absolute; our limited reason must content itself with relative knowledge.

If space did not fail me, I could show the extent to which Campanella's theories have influenced Descartes. The idea which he thoroughly grasped and which he often repeated is that we must scrutinise nature face to face, observe facts, and cast aside books and the opinions of men. He lauded experience, encouraged Telesio and Galileo, whilst at the same time, with an inconsistency which I noted above, he believed in magic and astrology.

In his metaphysics we may observe the importance which he assigned to impulsions and to will (*velle, amor essendi*); and Weber has asserted that "No one previously to Leibnitz conceived with greater clearness the fundamental idea of a concrete spiritualism." He was, as we know, imprisoned and persecuted despite his Catholicism; and after him, until the 19th century, Italy produced no metaphysician of his caliber. Italian thought repeats the echoes

of foreign lands and takes refuge in the observation of facts. But before it began to slumber it gave to the world that scientific method of which we have found the first exponents as early as the 15th century.

III.

THE FORMATION OF METHOD.[1]

Leonardo da Vinci (1452–1519) is perhaps the greatest intellect that Italy ever produced. He is certainly the grandest figure of the Renaissance. He possessed great productive power and breadth of view; he was at once painter, sculptor, engineer, scholar, philosopher, and writer; he was in advance of his times, for Leonardo's rank as a thinker was not discovered until the 19th century. If as a philosopher he did not exert much influence on his contemporaries, he nevertheless possessed on questions of science and method ideas as clear and modern as those of any scientist of our day. Experience, which appears to be the discovery of the 17th century, was even then his guide. "Shun," he says, "the doctrines of thinkers whose reasons have not been confirmed by experience." He observed and investigated incessantly; his notebooks are filled with the notes and sketches of all manner of things, and he gives very original instructions concerning methods of inquiry; he is rigorously deterministic, and a pronounced foe of miracles, occult sciences, and essences.

I cannot speak of Leonardo's discoveries in physics, geology, botany, physiology, and anatomy, and I shall limit myself to mentioning that we owe to him the law of inertia, the principle of least effort, and the first ideas on comparative anatomy. His gnoseology, which we find scattered throughout his manuscripts and which an Italian scholar, M. Solmi, has well reconstructed, is important, and we find in it ideas which pass as quite modern. He respects the ancients, but rejects the principle of authority and was a declared enemy of scholasticism. Although his preference was always for induction, he asserted before Descartes that mathematics was

[1] For the history of the experimental method see R. Caverni, *Storia del metodo sperimentale*, Florence, 1891–1895.

the most perfect form of human knowledge, and he declares that we can call only those branches of knowledge sciences which we can reduce to mathematical form. His psychology is quite profound and represents an advance over his predecessors: he was the first to observe reflex movements. If he is almost a positivist, he is not a materialist; and while he insists on the psychophysical relations, he connects mechanical necessity with moral necessity. The life of man, he says, helps us to comprehend universal life. Our body is created by our soul, and it is the same with the world as with man; it is the spirit which moves it and organises it. His cosmology, which recalls slightly that of Anaxagoras, is less original, but his ethics contains principles, preponderantly individual in character, which have not always been understood, even to-day.[1]

In the 15th century, Leonardo stood almost alone, but in the 16th he had his successors, of whom I shall mention the following: Aconzio (1492–1567), known principally as a theologian, but also the author of a book, *De methodo* (1558), in which he anticipates Descartes in his theory of innate ideas and geometrical analysis; Giambattista della Porta (1530–1615), scientist and observer, who founded the Academy of the *Secreti* and to whom the invention of the telescope and the camera obscura is attributed; Pietro Sarpi (Fra Paolo of Venice, 1552–1625), famous for his political vicissitudes and as the author of a very important treatise on logic, with sensationalist tendencies, and containing theories which read as if borrowed from Locke; Bernardino Telesio (Cosenza, 1509–1588), who was in the south of Italy the representative of new naturalistic and empirical tendencies. The latter abandoned Plato and Aristotle and sought to create a speculative doctrine with the aid of observation and experience alone. He rejected abstractions and

[1] Regarding Leonardo as a philosopher, see in addition to the general biographies (Müntz, Séailles, etc.) the following works: H. Grothe, *Leonardo da Vinci als Ingenieur und Philosoph*, Berlin, 1874; L. Ferri, "Leonardo da Vinci, scienziato e filosofo," in *Nuova Antologia*, 1873; Fritz Raab, *Leonardo da Vinci als Naturforscher*, Berlin, 1880; Prantl, *Leonardo da Vinci in philosophischer Beziehung*, Munich, 1885; W. R. Thayer, "Leonardo da Vinci, a Pioneer in Science," *The Monist*, July, 1894, pp. 507–533; E. Solmi, *Studi sulla filosofia naturale di Leonardo da Vinci*, Modena, 1898.

sought for real things (*realia entia non abstracta*), declaring that he preferred induction and experience to all the distinctions of scholasticism.[1] He succeeded in surrounding himself with a group of disciples among whom are to be mentioned Quattromani, Cavalcante, Gaeta, Donio, Persio, Montano, and Bombino. One of his pupils, Aulo Giano Parrasio (1470–1534), even founded an academy which was afterwards called the Telesian; but despite the boldness of his theories and the great labors of his school, it does not seem as if the results were very productive for science. The contrary was the case with the experimental school of Tuscany, the renowned founder of which preferred investigations to theories.

The name of Galileo Galilei (1564–1642) is too well known to require comment. His discoveries in physics and astronomy have made him familiar to the whole world.[2] He is less known as a philosopher, and as a matter of fact never wrote a purely speculative work. Yet his reflections on method and science, although scattered through his scientific writings and his letters, could be easily collected and would form a methodological work far more solid than the *Novum organum*. According to the studies of Tönnies, Natorp, Löwenheim, and Grimaldi we must also see in Galileo a philosopher of nature. It is true, he has assumed no defined attitude toward metaphysical hypotheses, but he possessed a real cosmology, a mechanical and atomistic conception of the world, which resembled that of Democritus.

Galileo's influence in Italy and abroad has been very great, and it will be sufficient merely to recall to mind the great debt which Descartes and Hobbes owe to him. If we compare him with Francis Bacon, we see plainly that he was far greater in intellectual stature. Not only did he precede Bacon in clearly stating the worthlessness of the old method and in formulating the rules of the new, but there is absolutely no trace in his works of the ridiculous

[1] Regarding Telesio, see L. Ferri, *La filosofia della natura e le dottrine di Bernardino Telesio*, Turin, 1873; F. Fiorentino, *Bernardino Telesio*, Florence, 1872.

[2] The bibliography of Galileo is very rich (A. Carli and A. Favaro, *Bibliografia Galileiana*, Rome, 1896). The most important studies are those of M. A. Favaro.

intellectual survivals and grotesque ideas found in those of the English chancellor. He did not *dream* of a machine for making inventions; he made them.

We see thus that the leading ideas of the English empiricism of the 17th century are of Italian origin and were formed during the 15th and 16th centuries. As the significance of Kant was lessened after a better study of Locke and Hume, so the glory of Bacon will be lessened after a profound study of our philosophy of the Renaissance.

IV.

THE SPECULATIVE SLUMBER.

Italy was already beginning to show marks of exhaustion toward the end of the 16th century. The peninsula was divided and subject to absolute foreign governments, the counter-reformation had already begun its work, and the Renaissance, which had originated with the 14th century, had now flourished for 300 years; it will hence be intelligible why the 17th and a part of the 18th centuries were a period of decadence. It demanded great effort to be for 300 years the focus of European civilisation; the nation as well as the individual needed rest.

But the 17th century was not entirely one of decadence. Science continued its profitable labors, and art still produced meritorious works, now much decried but in their day still the envy of Europe. I refer to Marini and Bernini. Italy was not dead; she merely slept.

The succession of scholars which formed the school of Galileo, to which belonged the famous names of Torricelli, Viviani, Castelli, Redi, Magalotti, Marchetti, Bellini, and others, enriched the sciences of observation with precious discoveries and literature with models of clear and elegant prose; but there was not one philosopher among them. Thus more and more did the development of the national intellect depart from the domain of pure thought. Italy, writes M. Barzellotti, had no distinct speculative movement during the 17th and 18th centuries.

At this date the invasion of foreign, and particularly French,

ideas begins. Descartes, Malebranche, Leibnitz, Wolff, Gassendi, and Locke were introduced into Italy in turn and represented modern thought among the Aristotelians, Platonists, and Thomists, who repeated and commented on the past. The ideas of Descartes, and shortly afterwards those of Malebranche, found among us many admirers.[1] Gregorio Caloprese, Tommaso Cornelio (1614–1684), Michelangelo Fardella (1650–1718), Tommaso Campailla (1668–1740), Alfonso Borelli, Valentino Alberti, although they sometimes make pretensions to originality only repeat with slight alterations and minor differences what the masters of France said before them.[2] The most remarkable among them was without doubt the Sicilian Michelangelo Fardella (1650–1718), who in 1691 published his *Universæ philosophiæ systema* (Venice). Fardella lived in France and there became acquainted with Malebranche and Arnauld. In method he is a genuine Cartesian, and he accepts innate ideas, combating the sensationalist dogma of *Nihil in intellectu, etc.* He thus closely resembles Malebranche, and, in his zealously maintaining that the existence of bodies cannot be shown in any manner, he sometimes appears to anticipate the English idealists Collier and Berkeley.

But the Cartesian philosophy also found its adversaries in Italy and controversies were common concerning particular questions, like that of the soul of beasts, etc. Among the adversaries of Descartes, such as Agnani, Pino, Ceva, we find one celebrated name, Giovanni Battista Vico (1668–1744),[3] whom we must pause for a moment to consider.

Vico is best known as a writer on the philosophy of history, but he has also touched in his works on almost every problem of

[1] On the Cartesian philosophy of Italy see Bouillier, *Histoire de la philosophie cartésienne*, Paris, 1854, Tome II., Chapter XXII.; K. Werner, *Descartesisch-Malebranchesche Philosophie in Italien*, Vienna, 1883.

[2] One of the latest Cartesians of Italy was Sigismondo Gerdil (1740–1802), who defended Malebranche against Locke.

[3] See the studies of Ferrari, Sarchi, Michelet, Cattaneo, Labanca, Rossi, Croce, Cosentini, Giordano; also K. Werner, *Giovanni Battista Vico als Philosoph und gelehrter Forscher*, Vienna, 1879. See Cantoni, *Giovanni Battista Vico*, Turin, 1867; R. Flint, *Giovanni Battista Vico*, London, 1884 (Italian translation Florence, 1888).

philosophy. He was inspired chiefly by Plato and Bacon, and he was a foe of the scepticism and the Cartesian rationalism of his day. Nevertheless, his method has geometrical tendencies, and his *degnita* (axioms) sometimes remind us of the definitions of Spinoza. His greatest originality consists in his having introduced collectivities into the world of thought. His *Principi di una scienza nuova* (principles of a new science) is quite original, although the origins of his conceptions are sometimes traceable to Plato and St. Augustine, or still later to Machiavelli, Campanella, Bodin, and Grotius.

Vico's historical system is substantially as follows: Men issued from their primitive bestial state under the goads of necessity and utility, which induced them to form societies. The development took place in three stages: first, the divine age in which society is patriarchal, with an absolute master and the weak overpowering the feeble; secondly, the heroic age with its aristocratic monarchy, where the nobility and the people are arrayed against one another; thirdly, the human age, which established equality and the reign of law. Every people passes through these three periods, and in the end is either destroyed or reverts to its primitive state. Thus, history is a universal rotation formed of *corsi e ricorsi.* But the importance of the thought of Vico lies not only in this general view of humanity, which, like all historical systems, is artificial. In his works are also to be found valuable scattered observations on individual and social psychology, on law, sociology, and method. It may be said that he constructed a real philosophy of the mind and in a certain sense he anticipated Kant (Spaventa). He was the first, long prior to the Germans, to raise the Homeric question, which denied the personality of Homer; he maintained and demonstrated the parallels existing between children and primitive men, and lately M. B. Croce, a well-known philosopher and historian, has shown that we may regard him as the real creator of the science of æsthetics.[1] But his work long remained unnoticed, for he did not belong to his time and his greatness was not discovered

[1] B. Croce, *Estetica: Teoria e storia*, Palermo, 1902, pp. 228–243.

until the last century, in Italy, France, and Germany.[1] He is a continuation in some measure of the line of the Renaissance, but he has qualities which are distinctively modern, and we may characterise him as the last of the old thinkers and the first of the new.

V.

THE ITALIAN "AUFKLÄRUNG."

Italy also had its encyclopædists and its illuminati. They were inspired mainly by French thinkers, as these latter had in part been inspired by the English, and they consequently exhibit similar characteristics. As with their *confrères* across the Alps, the dominating philosophy was a sensationalism which went back to Locke, and sometimes leaned toward materialism. They were deists, proclaimed the rights of reason and natural morality, had cosmopolitan tendencies, were hostile to the clergy and the Middle Ages, and busied themselves with practical questions like law and sociology, rather than with speculative questions. They were a little narrow, a little dogmatic, a little commonplace; but that was the reason of their relative success, for the majority were certainly not born to entertain lofty ideas.

The Italian illuminati differ from the French, with whom they must be compared, by their greater critical moderation and more sincere respect for religion. The Italians, who love traditions, could never be absolute destroyers, and it would be almost impossible to conceive an Italian Voltaire.

The centers of the Italian *Aufklärung* were the cities of Milan and Naples. The northern group counted among them Francesco Algarotti (1716–1762), an Italian citizen of the world and populariser of Newton; Saverio Bettinelli (1718–1808), a Jesuit of an advanced type, celebrated for his criticisms of Dante; Gian Rinaldo Carli (1720–1795), scholar and polygraph, who aided in abolishing the Inquisition in Lombardy; Cesare Baldinotti (second half of the 18th century), disciple of Gassendi, Locke, and Condillac, who

[1] In connection with Vico we can mention Jacopo Stellini (1699–1770), who occupied himself a great deal with social philosophy (see Ardy, Luzzatto, Cicchitti-Suriani). Filangeri, Pagano, and Ferrari also show the influence of Vico.

sought to reconcile empiricism with dogmas; Paolo Frisi (1728-1784), traveller, mathematician, apostle of new ideas, who combated magic and the Jesuits; Alberto Fortis (1741–1803), progressive abbé and wit who died in France; Aurelio De'Giorgi Bertola (1753–1798), who was among the first to study German literature, and who published the first treatise entitled *The Philosophy of History* (1787). Of Della Torre Rezzonico, Caserotti, and the rest, we need not speak. The most famous of all this group were, however, three Milanese, the two brothers Pietro and Alessandro Verri and Cesare Beccaria, the founders of the *Caffé* which for two years (1764–1766) was the organ of the Italian encyclopædists.

Pietro Verri (1728–1797) was undoubtedly one of the most remarkable men of his time, and he was very active as an administrator and a writer. Although he was mainly occupied with politics, political economy, and history, he is entitled to a place in the history of Italian philosophy, not alone by virtue of his purely general ideas, which he held in common with the others, but by virtue of his psychological and moral doctrines. His two most important productions (*Discourse on the Nature of Pleasure and Pain*, 1773; *Meditations on Happiness*, 1781) contain new and ingenious ideas on the function of pain and the law of contrasts, which were afterward adopted by Kant, Schopenhauer, and Wundt and discussed by Dumont, Bouillier, and Regalia.[1]

His brother Alexander (1741–1816), although holding similar ideas, was not of the same prominence, and he also ranks below his friend Cesare Beccaria (1728–1794), whose work on *Crimes and Punishments* has made him famous throughout the whole world, but who is not, strictly speaking, important as a philosopher.[2]

The Neapolitan group was less numerous, but not less influential. We may count among them Pietro Giannone (1676–1748), a philosophical historian much persecuted by the Church; Ferdinando Galiani (1728–1787), political economist and wit, known mainly from his sojourn in France, and called by Marmonel a harle-

[1] Bouvy, *Le comte Pietro Verri et son temps*, Paris, 1893.

[2] See the essays of Villari and Paoli.

quin with the head of a Machiavelli; Mario Pagano (1748–1799), the successor of Vico and Beccaria, philosophical historian, esthetician and criminologist, and one of the martyrs of the Neapolitan revolution;[1] Gaetano Filangeri (1752–1788), author of a work called *The Science of Legislation*, original but inspired by Montesquieu; Niccola Spedalieri (1740–1795), who in his *Rights of Man* (1791) sought to reconcile Christianity with the new ideas of emancipation.[2]

As we see, these men are mostly sociologists occupied with the practical questions of ameliorating the conditions of justice and education, or combating prejudices. It is only seldom that they touch on purely philosophical questions. The only one that was outspokenly philosophical was Antonio Genovesi (1712–1769), who has left us numerous writings of metaphysics, logic, and ethics. He is at bottom an eclectic following in the main Locke and Leibnitz.[3] He infused a slight tincture of doubt into the dogmatic environment of his day, and denied the possibility of knowing substance, affirming that bodies are phenomena only. But he was a foe to metaphysical subtleties, which he said should be left to the monks. His greatest fame is perhaps associated with his work on political economy, of which he occupied the first chair ever established in Europe.[4]

The Italian encyclopædists did not end with the 18th century. They inspired two succeeding generations, the second of which came down almost to our own day, and joined hands with the first exponents of positivism. France also had its idealogues, inspired by Condillac, and its revolutionary humanitarians, who at last became absorbed in positivism and socialism, and until the end of

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[1] See G. Ottone, *M. Pagano e la tradizione vichiana in Italia*, Milan, 1897.

[2] See G. Cimbali, *N. Spedalieri*, Citta di Castello, 1880.

[3] The doctrines of Leibnitz were followed in Italy by B. Trevisani, T. Cattaneo, and others. The most celebrated representative of Leibnitz's philosophy in a modified form was the Sicilian Vincenzo Miceli (1733–1781). For information on this philosopher and on philosophy in Sicily generally, see V. Di Giovanni *Storia della filos. in Sicilia*, Palermo, 1873.

[4] See on Genovesi: R. Bobba, *Commemorazione di A. Genovesi*, Benevento, 1867.

the 19th century the intellectual influence of France on Italy was very great.

The second generation of our illuminati was that represented by Gian Domenico Romagnosi (1761–1835)[1] and Melchiorre Gioja (1767–1828). These men are sensationalists and strict followers of Condillac. Towards the year 1758 the Abbé Condillac took up his residence in Parma as the educator of the prince, and dwelt in that city ten years. His influence was great, especially in northern Italy, and his doctrines were translated and taught by Soave, Rezzonico, Barkovic, De Tommaso, Valdastri, Prandi, Corniani, Lomonaco, and others, none of whom produced anything very original. Romagnosi and Gioja used the postulates of sensualism as a means of establishing their social doctrines, which was their main concern. They applied sensationalism to psychology, to political economy, and to the philosophy of history, but their learning did not make amends for their lack of speculative originality. Like their predecessors, they were practical thinkers, having at heart the welfare of mankind.

The first of these two philosophers, in his *Laws of Civilisation* (1834), was the forerunner of the biological theory of society, which has again been developed in our day by Spencer, Schäffle, Lilienfeld, Novicow, and others, and who sustain the doctrines of the naturalness of phenomena, excluding *a priori* every form of the absolute.

Gioja, the founder of scientific statistics and a moralist of great popularity, was the author of original ideas on the necessity of the state, maintaining that the actions of individuals, if uncontrolled, would result in a useless and extravagant expenditure of energy, whereas the work of a directive governmental activity obtains greater results with less effort.

The third generation of Italian ideologists, contemporary with the movement for national unity (1850–1870), is closely connected with Romagnosi, for two of his disciples were its most distinguished representatives. Carlo Cattaneo and Giuseppe Ferrari are republi-

[1] G. Ferrari, *La Mente di G. D. Romagnosi*, Milan, 1835.

can patriots who mingled in the political events of their time while still preserving their master's taste for the social sciences and for popular humanitarianism.

Carlo Cattaneo (1802–1869), a publicist though not a philosopher strictly speaking, exerted considerable influence on Italian thought by his review *Il Politecnico* (1837–1848, 1860 and seq.), around which he gathered the most advanced minds of his country and put Italy into close communication with the thought of foreign countries.[1] Giuseppe Ferrari (1811–1876), whom we shall find among the sceptics, sought in his *Theory of Political Periods* to furnish an exact law for the movements of history. For him the unit of historical time is the life of a generation, approximately thirty years, and to each great historical movement there are four generations: that of the precursors who prepare the way, that of the revolutionists who act, that of the reactionists who oppose, and lastly that of the adjusters and reconcilers, who establish a new equilibrium to be again in its turn disturbed by new precursors.[2]

With these last-named encyclopædists, heirs of the French Revolution, are connected the first Italian positivists, of whom we shall speak in another article. In order to find again real philosophical speculation, we must retrace our steps to the beginning of the 19th century.

VI.

THE SPECULATIVE AWAKING.[3]

The Critique of Pure Reason appeared in 1781, but it took nearly half a century for it to reach Italy in the full sense of the word.

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[1] A. Mario, *La mente di C. Cattaneo* (in *Rivista Europea*, 1870).

[2] L. Ferri, *G. Ferrari e le sue dottrine* (*Atti dell'Accad. de 'Lincei*, S. M. 1876–77).

[3] For information concerning the Italian philosophy of the 19th century, see Marc Debrit, *Histoire des doctrines philosophiques dans l'Italie contemporaine*, Paris, 1859; R. Mariano, *La philosophie contemporaine en Italie*, Paris, 1868; L. Ferri, *Essai sur l'histoire de la philosopie en Italie au XIX^e^*, Paris, 1869 (2 vols.); G. Barzellotti, "Philosophy in Italy," *Mind*, 1878 (Italian trans., in *Nuova Antologia*, 1879); A. Espinas, *La philosophie expérimentale en Italie*, Paris, 1880; K. Werner, *Die italienische Philosophie des neunzehnten Jahrhunderts*, Vienna, 1884–1886 (5 vols.). In this chapter I have followed in the main the erudite essay of Barzellotti; Franck, Ferrari, Fiorentino, etc., may also be cited in this connection.

The first Italian translation, by Mantovani, is from 1821–22, and shortly after this the doctrines of Kant were expounded and discussed by Bonfadini, Testa, Ricobelli, as well as made the subject of a course of lectures at Naples by Ottavio Colecchi.

Pasquale Galluppi (1770–1846) also taught at Naples and propounded doctrines similar to the critical philosophy, although at the time he was unacquainted with the works of Kant. For him also the problem of knowledge was the central one of all philosophy, but the only *a priori* which he would admit was that of the moral ideas. The form of knowledge is empirical in origin, and his subjectivism culminates in a psychological realism which recalls Reid and his school, whilst his ethics approaches very closely to that of Kant. He had the great merit of being a real philosopher outside of the narrow confines of religious dogmatism and unaffected by material considerations. He also knew well the history of modern philosophy.[1] He has been considered the first of the line of philosophers who originated in Italy a purely speculative movement which was in certain of its features national, but he was more liberal and modern than any of his successors.[2] In fact, the philosophers most prominent at this period, viz., Rosmini, Gioberti, and Mamiani, knew the modern systems prior to and succeeding the *Critique*, but they did not fully understand them. The Italians had grown unused to speculation, and they could not suddenly overtake the other nations that had been marching toward the future. Besides, two great events had modified "the intellectual climate" of Italy: the French Revolution and the formation of the kingdom of Italy, which had sown the seeds of liberty and independence from which the great national movement was to spring; and the romantic, idealistic Catholic restoration, which was not favorable to negations and the neglect of dogmas. Thus, the absence of a national and secular speculative tradition, preoccupation with patriotic duties, and anxiety to preserve the fundamental dogmas

[1] A contemporary of Galluppi is another Neapolitan, Vincenzo Di Grazia, whose doctrines also bear a marked resemblance to those of Comte.

[2] See Lastrucci, *Pasquale Galluppi*, Florence, 1890.

of Catholicism, produced a philosophy which was modern and independent in form but ancient and narrow in contents.

The Abbot Antonio Rosmini (1797–1855), sometimes called the Kant of Italy, propounded in his *Nuovo saggio sull' origine delle idee* (1830), the same problem as did the *Critique*, from which its author accepted the doctrine of the *a priori* character of knowledge. But while Kant posited a plurality of synthetic principles *a priori*, Rosmini sought to show that they could all be reduced to a single one, viz., that of simple possibility and ideality, the idea of indefinite being, innate in the mind, determined through its union with the real, and given by sensation. But he departed considerably from Kant with regard to the origin and the value of the form of knowledge. According to Kant, the categories are the results of the activity of the mind, while according to Rosmini the idea of possible and indefinite being is of divine origin and something similar to the Platonic intuition. For the philosopher of Königsberg the *Critique* is the preparation and the foundation of a new metaphysics; whilst precisely the contrary is the case with Rosmini, who is in almost perfect accord with orthodox theology, yet notwithstanding this fact was unable to escape the censure of the Church. Forty of his propositions were condemned, and his disciples, who were quite numerous in the clergy of northern Italy, have been persecuted even to our day. Despite the profound views discoverable in his works, especially in his *Psychology* and his *Morals*, and even recognising that his system is perhaps the best attempt ever made to reconcile philosophy with the doctrines of the Catholic Church, it must still be admitted that in him the needs of religion stifled the critical thinker and the penetrating analyst.

In his first efforts, Vincenzo Gioberti (1801–1852) departed even more widely than Rosmini from modern thought. For the Rosminian principle of possible being, he substituted the famous formula, *L'Ente crea l'esistente* (the Ens creates the existent). For him, therefore, the fundamental principle of the mind is not the possibility of existence, but the intuition of the same divine reality (*Ens*, Being) which creates the finite realities (existences). Thus, exclaimed M. Barzellotti, was the fiat of Genesis posited as the

foundation of science. And whilst for Rosmini the synthesis of the ideal and the real is the work of the mind, and the second is given by experience, for Gioberti the synthesis is already given in the primitive intuition. Thus, the entire activity of thought resolves itself into translating into reflex language a direct divine revelation, and at bottom, thus, the entire procedure of science is *a priori*. But if Gioberti's philosophy was in complete contradiction with modern thought, it was in complete harmony with the national aspirations of Italy. His *Primato*, in which he maintained the superiority of the Italians in all matters over all other nations, was the Italian book most read about the year 1848 and became one of the factors of our revolution.

After the defeat of the national party (1848–1849), Gioberti, being in exile, changed his political and philosophical views. In his *Protologia* (a posthumous work published in 1857), he distinguishes carefully between philosophy and religion and approaches Hegelianism and Pantheism, which he is desirous of reconciling with Platonism and Christianity. He tended thus subsequently towards rationalism and abandoned his dogmatism, but his later works did not have the same influence as his first.[1]

Between Rosmini and Gioberti comes a philosopher who has represented down to our day the philosophy of spiritualism, and who in some respects was the Cousin of Italy, whom he greatly resembled in the influence he exerted. This philosopher is Terenzio Mamiani (1799–1885). After having in his youth taught the philosophy of experience which he discovered in the philosophy of the Italian Renaissance, he finally took up with idealism, occupying a place midway between Rosmini and Gioberti. Poet and man of letters, he was fond also of Plato, and his Platonism appears to good effect in his *Dialoghi di scienza prima*, in which he affirmed the absolute objectivity of ideas. His epistemology aimed to prove that we apprehend finite and infinite reality directly; he admits ideal perception and vision and reconciles Plato and Aristotle by affirming that every universal is *ante rem* and every act of knowledge *post*

[1] The best book on these two philosophers is that of M. G. Gentile, *Rosmini e Gioberti*, Pisa, 1900.

rem. For him the noumenon is accessible to thought, and he thus departs from the position of Rosmini, who denied the imposition of absolute reality. His cosmology is an optimistic monism in which the influence of Leibnitz is clearly revealed; but his philosophy of history is in the main original. The influence of Mamiani on Italian philosophy has been considerable; he founded an academy of Italian philosophy (1850–1855), which did not succeed, however, in amalgamating the philosophical sects, and he created and edited a philosophical review (*Filosofia delle scuole italiane*, 1870–1885), in which to the very last he criticised new theories. He was for a time the head of the official instruction of philosophy of our country.[1]

Rosmini, Gioberti, and Mamiani are the three great names of the Italian speculative movement, the golden age of which was in the first half of the 19th century. But around these we may group several other philosophers more or less independent, who have as their common characteristic the desire to uphold Christianity, seeking to reconcile it with reason and philosophy and following the spiritualistic or idealistic tendencies.

Without occupying ourselves with the faithful disciples of Rosmini (Manzoni, Tommaseo, Cavour, Pestalozza, Tarditi, Corte, Peyretti, Paganini, Monti, Bonghi, Garelli, Rayneri, Allievo, Minghetti, etc.), or those of Gioberti (D'Acquisto, Romano, Garzilli, Toscano, Fornari, Acri, Di Giovanni, etc.),—not to mention strict Catholics who imitated the Schoolmen (Ventura, Liberatore, Tapparelli, etc.),—we may be permitted to note the names of G. B. Bertini (1818–1876), who was partly a disciple of Gioberti but concerned himself mainly with the history of philosophy; Domenico Berti (1820–1897), known for his studies on Bruno, Campanella, and Galileo; Augusto Conti (born in 1832), at first a disciple of Gioberti, creator of a system of "perennial philosophy" founded on common sense and revelation, and which was in principle in accord with the dogmas of the Church; and Francesco Bonatelli (born 1830) who defended the Catholic faith in ethics and followed in

[1] See Mestica, *Discorso sulla vita e le opere d'Terenzio Mamiani*, Florence, 1895.

psychology the doctrines of Herbart. But toward the middle of the century a movement arose which was opposed to this national and Catholic philosophy extending from Rosmini to Conti; and we then had two antagonistic schools or rather two antagonistic tendencies. On the one hand were the disciples of Rosmini and Gioberti, who endeavored to harmonise philosophy and religion and who sought to make philosophy Italian; and on the other the disciples of the Germans,—the Kantians, the Hegelians, and the Sceptics.

Towards 1848, there was formed at Naples, where philosophy had been more stimulated and cultivated than in any other part of the peninsula, a group of Hegelian thinkers who were dispersed by the vicissitudes of politics, but who after 1830 formed their school anew in the same city, which had been alternately the nursery and the stronghold of Italian Hegelianism.

The most remarkable representatives of this movement were A. Vera, Bertrando and Silvio Spaventa, Francesco De Sanctis, C. de Meis, R. Mariano, S. Gatti, F. Persico, A. Tari, M. Florenzi Waddington, P. Ceretti, D'Ercole, and others. Two tendencies are distinguishable here: the orthodox, which reproduced faithfully the German master (Vera, Mariano), and the critical, which had more numerous and more important followers.

The most faithful disciple of Hegel was without doubt Augusto Vera (1830–1885), one of the most active disseminators of the theories of absolute idealism in Italy, France, England, and other countries. Incomparably more important for Italian thought was Bertrando Spaventa (1817–1883), who was the critic of the school and who in one of his writings (1850) attacked the Italian school of Rosmini, Gioberti, etc. in the name of absolute idealism. He also sought to renew the national tradition without going back so far as scholasticism, and he contended that the national thought had been checked in the Renaissance with Bruno, the precursor of Spinoza, and with Campanella, the percursor of Descartes. But in his later writings he discovered that Galluppi and Rosmini have been Kantians without knowing it, and it was ultimately reserved for him to

say that Gioberti had been a Spinozist in his first works and a Hegelian in his last.[1]

The influence of the Hegelian philosophy was very great on the critical and æsthetical studies of Italy, and Francesco De Sanctis (1870–1883) is considered the greatest critic of modern Italy. In the sciences, Camillo De Meis (1817–1891) in his work *Tipi animali* sought a new solution of the problem of the transformation of species, and attempted to reconcile the results of Darwin with the principles of idealism. Pietro Ceretti (1823–1884), instead of narrowly following his German master, attempted to continue the Hegelian speculation by constructing a new system; but it does not appear that his attempt was a happy one.

The sceptical group of the opposition is not near so large. Speculative scepticism has not deep roots in Italy; it is a product of importation. We find here Giuseppi Ferrari (1811–1876) whom we have already met among the last of the illuminati, but who in his *Filosofia della rivoluzione* (1851) has expounded in a very singular form the phenomenalism of Protagoras as rejuvenated by the empiricism of the 18th century and the critical philosophy of Kant. Starting with the continual becoming, he makes necessary contradiction the law of being and thought, and ends with denying the value of logic and science,—a conclusion which does not prevent him from believing in his own historical arithmetic.

Ausonio Franchi (his real name is Cristoforo Bonavino, 1820–1893) also derived his inspiration from the Encyclopædia and Kant, and in his *Filosofia delle scuole Italiane* (1852) he subjected to a searching criticism the idealism of Rosmini and Gioberti, whom he identified with the scholastics. He wrote many works, of which none was very popular, in which he combated the theism and the dogmas of the Church, vacillating between sensism (based on sentiment or on sensation) and the critical philosophy of Kant; but in the last years of his life he donned the robe of a monk, and in his last work (*Ultima critica*) he reverted to the doctrines which he had at first so bitterly opposed.

[1] See the philosophical writings of B. Spaventa, edited by M. Gentile, Naples, 1900.

We have here reached the threshold of the epoch in which we now live. But I cannot quit this period without at least making mention of two men who have exercised a certain influence on Italian thought, although they do not in the true sense of the word belong to philosophy. I refer to Giacomo Leopardi (1799–1837), who expounded a definitive and hopeless pessimism in his lyrical poems and essays, and was the author of thoughts full of humor and bitterness widely read by our youth; and to Giuseppe Mazzini (1808–1872), a celebrated revolutionist, who was the enthroned apostle of moral, spiritual, and humanitarian deism.

But while the different philosophical movements of which we have spoken were disputing for the mastery (1850–1870), in France and England a new positive philosophy was forming which, allied with evolutionism and monism, was destined to triumph over the whole civilised world. Italy, by its traditions of experimentalism and encyclopædism, was a favorable medium for the reception of these new or rejuvenated ideas. Toward 1870, positivism began to be mentioned with us, and it is at this point that we shall next begin when we endeavor to survey the philosophical movement of new Italy (1870–1902).

GIOVANNI PAPINI.

FLORENCE, 1902.

LITERARY CORRESPONDENCE.

FRANCE.

M. GEORGES LECHALAS offers us a number of *Æsthetical Studies* which without question rank among the very best that have been published on this subject for a long time. It is true, he expounds and discusses rather than offers positive contributions; but I am far from criticising him for having done so. In questions so complicated and delicate as the present, it is befitting first to acquire knowledge, and it is to this task that he applies himself with success.

In the first three studies, which are entitled "The Beautiful and the Ugly," "What is Art?" "Art and Nature," M. Lechalas prepares for the examination of a most important problem, which he exhaustively treats in the three following studies: "Art and Mathematics," "Suggestion in Art," "Alliances and Associations of the Different Arts."

There is at the basis of our organic nature a tendency to rhythm; if it is difficult to discover this rhythm in our movements, it is because our will almost always intervenes as a disturbing element. Very conspicuous in music, there is less rhythm expressed in ordinary speech, but much more of it in oratory, and still more in poetry. M. Lechalas recalls on this subject the experiments of the Abbé Thiéry at Louvain, from which it would follow that the spoken word exhibits all the essential characters of music and notably the relation of all the notes to the tonic, with this difference, that the tonic is here not very distinct; but whatever the characters common to music and poetry may be, he correctly says, it is in music alone that we can study with precision the mathe-

matical laws controlling the pitch of sounds. He sketches very rapidly the transition from the natural gamut to the Ptolemæan gamut, and then enters upon an examination of the theory of the natural gamut as explained by the Abbé De Lescluze,—a theory which is the more important, as this last-named author has based on the same conception a theory of colors.

This is not the place to expound the last-named theory, even if I could do so in a few words; but it is very clear that this question of the relation of music to painting is sown with snares, as the many divergent explanations it has received show. If the two stimuli, sound and light, have as their base the same physical element, viz., vibration, their elaboration in the sensory organs has differentiated them strangely, and the translations which have been made of them in the brain are not exactly comparable. Musicians cannot speak of color, or painters of *timbre*, save by metaphor. The gamuts of the painter rest on two principles, coloring and illumination; that is to say, on the order of the wave-lengths and on the degree of saturation; and they are thus, by their composition, quite different from the musical gamuts and render any complete comparison between the register of colors and that of sounds difficult. And if these difficulties did not prevent our discovering an analogy between the two, they yet indicate that we must be on our guard against misunderstandings into which language can lead us.

Bnt we hasten to add, the question is not that of exhaustively comparing excitants and sensations; the sole thing at issue for a rational theory of æsthetical affinity is to discover a "law of rhythm" which shall be the same for the hearing as for vision. One point already gained is that there exists a law of rhythm for each one of these two senses; but it is legitimate to push the analysis farther, and I also am of the opinion with M. Lechalas that we are not pursuing a chimera in attempting to reduce sensibility to mathematical formulæ, although this reduction has hitherto not been accomplished save in an imperfect manner and by the aid of hypotheses.

I shall not speak of the last studies of M. Lechalas's work, viz., "Art and Curiosity," "Art and Ethics," despite their interest-

ing character, as this would lead me too far. The book is truly one to be read.

* * *

Dr. Paul Richer of the Academy of Medicine, to whom we already owe a rare and beautiful illustrated work, "Art and Medicine," begins with an *Introduction* an important collection of books which is to bear the title of *The Human Figure.*[1] It is to be devoted to the study of the human form in all its aspects and all its conditions as well as to the history of its representation by the artists of all times and countries. Scientists and writers on art will contribute to this collective work, which will be profusely and very carefully illustrated. I therefore expressly call the attention of our readers to this interesting enterprise. The introduction which is offered to them treats in particular the study of the nude, of the relations of art and science, and of the problem of æsthetics connected therewith. M. Paul Richer looks forward with confidence to the future of art, which in his opinion is bound up with the future of science; and he shows himself in this attitude to be diametrically opposed to the discouraging opinions of Taine and Renan.

* * *

In connection with these books on æsthetics, I shall mention a thesis presented to the University of Berne, Switzerland, by M. Paul Peteut, in which this author expounds the doctrines of the Abbé Baptiste Dubos (1670–1742) as a sort of contribution to the history of æsthetic doctrines in France. Dubos, according to German authors, is the most widely cited of our æsthetic writers, and his influence on German æsthetics is unquestionable. This little work, which is a very good *résumé* of its subject, comes at the right time and deserves to be well received.

* * *

I had some criticisms to offer on a former philosophical work (*Que sais je?*) of M. Sully-Prudhomme, one of the rare poets of our day, and an enlightened and interesting spirit. His present volume, *Le problème des causes finales*, is the fruit of a noble effort,

[1] Paris, Gaultier-Magnier. When no publisher is mentioned, it is understood that the books are published by F. Alcan.

and of a penetrating thought. It is made up of letters addressed to M. Charles Richet on the occasion of an article published by the latter in the *Revue Scientifique* under the title "L'effort vers la vie et la théorie des causes finales." M. Sully-Prudhomme analyses the concept of finality with great skill and points out the conditions under which this concept remains scientific and at what moment it becomes metaphysical. He endeavors to present a just criticism of determinism as well as of that doctrine of final causes which involves "liberty," or the new character of an act independent and "conditioning." He asks "how can there have arisen in him the consciousness of that sort of activity which in the deterministic conception of the universe not only does not exist but, right the contrary, is the negation of what exists, viz., universal determinism?" His poetic instinct recoils from renouncing the salvation of things, "which I would not believe to be chimerical," he says, "save in the last extremity." In the course of his patient discussions he has ingenious comparisons to offer and many profound *aperçus*; thus, for example, he remarks that mind and matter, which appear to us to be irreducible one to another, when we consider them in their phenomena, actually tend to become identified when we descend regressively to the substratum. He is inclined accordingly to monism.

He also emphasises the remarkable and evident fact of the contradiction which inheres in the data of metaphysics; but he does not to my mind draw with sufficient boldness the conclusion which must be drawn for the necessity which forces us to include our judgments under the category of antinomies. Occupied as I myself am at the present moment in pondering anew upon the problems of which M. Sully-Prudhomme here treats, I find that my thought is at times in agreement with his and at times finds its consummation in it. Many readers, I believe, will derive profit from the reading of his book, even though some will not accept its prudent reservations or others its inspiring idea.

* * *

M. Paulhan adds a new volume, *Analystes et esprits synthétiques*, to his beautiful series of works on character. It is perhaps the

most interesting of them all. He studies here with care and penetration the two classes of men who are distinguished by characteristic tendencies toward analysis or toward synthesis. He describes the different types, examining their good qualities and their deficiencies, and finally he shows how these two types of mind, so much opposed to each other in their striking manifestations, are at bottom complementary and accomplish by their joint labor the entire work of the mind.

I might perhaps have some objections to make regarding the attribution of one of these types rather than the other to such and such painter or musician. It is at least interesting to observe that the painter Eugène Delacroix, "synthesist" for example, had no taste for the methods of Victor Hugo, although they were quite similar to his own, and preferred the classical Racine to this god of the romanticists. The literary judgments of a painter may involve the appreciation in poetry of other qualities than those which he possesses in his own art, and it is difficult to say of any given individual that his nature is absolutely synthetic or analytic if we take him in his entirety.

As to the classification of characters, the work of M. Paulhan nevertheless affords us the most important distinction which can be made, when we come to consider exclusively the intellectual qualities of the individual. Hitherto he had distinguished minds as logical and illogical, which was a different mode of estimating the qualities of the intellect. But this second point of view is of secondary importance as compared with the other,—at least, in so far as the correctness or incorrectness of the intellectual operations is not concerned with the operation and the union of elements put into play either by an analysis or a synthesis.

Correctness and incorrectness, moreover, depend also on the quality of the affective and sensorial data which enter into the operations of our mind, and for this reason the value of our judgment may be influenced by our affective character. Everything is connected together in that living synthesis which each one of us is,—sentiment, thought, and action.

In a volume entitled *Essai d'une philosophie de la solidarité*, a collection of lectures and discussions by M. Léon Bourgeois and others, we shall not find much light on the problems which the word *solidarity* suggests; in fact, the extreme confusion of ideas relative to this problem is very evident from the work. None of these discussions appear to be practical, and I see in them only the ingenious exercises of sociological thought, pretty much as the controversies of the Middle Ages were ingenious exercises in metaphysical dialectics. The idealogues go their way and life goes its way. Practice creates every day more facts than our hesitating theories explain. They are baffled by the wealth of the social facts that spring spontaneously from the necessities of existence, and cannot profit much from oratorical tilts. Moreover, solidarity is a fact, but the feeling for this fact is not in itself a virtue, neither can the expression of this fact form a doctrine. As long as pity, compassion, and love are mingled with the sentiment of solidarity, it will merge itself in the good old "charity"; as long as we treat of these things by the way of science, it is nothing more than a special point of view of sociology.

* * *

From the pen of M. Karppe, a scholar of great erudition, we have *Essais de critique et d'histoire de philosophie*, treating of Philo and the early Fathers, of the ideas surrounding rising Christianity, Maimonides, Richard Simon, Spinoza, etc.,—an interesting volume the reading of which I very strongly recommend.

* * *

M. Camille Bos has chosen as a subject for study *The Psychology of Belief* (*Psychologie de la croyance*). He shows belief to be connected with our *activity* as expressing it in all its degrees and transforming itself and elevating itself according as the individual frees himself from automatism and becomes more personal. Our belief, he says, is the force which moves the world; it expresses our progressive faculty, it supplements our ignorance of the universe, and adds itself to our science in order to fulfil it. It will exist, therefore, as long as contradiction and incertitude exist for human reason, which is tantamount to saying that it is indispen-

sable to our reason, and it transcends logic and expresses the very postulate of life.

* * *

M. Paul Lapie devotes a large volume to the subject of *The Logic of the Will* (*Logique de la volonté*). I can only indicate his point of view, which is to show how the act of willing depends on our judgments and how all the characters of will are explained by the characters of our judgments, so rendering it necessary for us to resort to a mysterious power to explain human action.

* * *

M. E. Goblot recapitulates in his *Justice et liberté* the elementary truths of ethics and expounds them with originality and force. I shall note here in passing the reaction which is manifesting itself in psychology in favor of intellectualism. It is one of the phases of the inevitable alternation which theories undergo. The notion of the unconscious has succeeded the classical division of the faculties of the soul, and in its turn this notion of a physiological motor is tending to resolve itself for certain authors into the study of directly apprehensible operations of the mind.

* * *

M. Adolphe Landry discusses very tersely the problem of penal responsibility (*La responsabilité pénale*). He dismisses the ancient doctrine of expiation by punishment and sees in punishment only a means by which society has endeavored to combat crime. The notion of degrees of responsibility is undoubtedly connected with the classical doctrine, that punishment, being expiatory, should be proportioned to the offence committed. But it is also justified from the point of view of utility, according to which punishments should be chosen that are most useful socially. In practice we did not arrive at this result by *individualising* punishment, as certain criminologists have suggested. It would be more advisable to establish degrees of responsibility and "to divide the subjects for punishment into classes, the same treatment being reserved for all members of the same class"; the penal treatment, on the other hand, would be so calculated as to assure intimidation

and example; and the classes would be established by taking account of the complicated data of the problem.

I will not treat here incidentally of so grave a question; some day the occasion will present itself for our returning to it. Yet let us be careful in every reform not to efface from the law its moral signature and its high character of duty. Let us not *demoralise* either the act or the punishment; this would be contrary to social utility; and I make this criticism without accusing M. Landry of not having recognised it.

* * *

From Dr. J. J. Van Biervliet, whose *Studies in Psychology* I should have mentioned before, we have a series of excellent *Causeries psychologiques*. The learned author recapitulates here in clear form and concise language the results of the experimentalists on the following different subjects: the reverse sides of joy and sadness, the problem of memory, and the forms of embarrassment.

We have from M. André Mayer an *Essay on Thirst* (*Essai sur la soif*), an excellent review of which by Dr. Dumas will be found in the *Revue Philosophique* for June, 1902; from M. Bourdon a volume on the *Visual Perception of Space* (Paris, Schleicher, publisher); from M. G. Encausse (Papus), *L'occultisme et le spiritualisme, théories philosophiques et adaptations de l'occultisme*, illustrated with figures, one of which represents the physical organs of the *astral man!*

* * *

The Historical Collection of Great Philosophers has two new volumes, one by the Abbé Lafontaine entitled, *Le plaisir d'après Platon et Aristote*, an excellent work in philosophical analysis, justifying and consummating the doctrine of Eudemonism; and the other by M. Paul Louis Couchoud on *Benoit Spinoza*.

M. Xavier Léon gives us *La philosophie de Fichte*, an extensive work to which M. Émile Boutroux has added a preface. M. Joseph Fabre begins in *La pensée antique, de Moïse à Marc-Aurèle*, a sketch of the evolution of human thought; his work is composed mostly of citations.

The *Année psychologique* and the *Année sociologique* still continue to be valuable and complete; they are indispensable to all workers in this field. The last-mentioned volume contains two original memoirs, one by M. SIMIAND, *Étude sur le prix du charbon en France et au 19 siècle;* the other by M. DURKHEIM, *Sur le totémisme.* M. Simiand's study is an essay, which I can highly praise, on the precise determination of an important economic phenomenon. M. Durkheim labors to fix precisely the notion of totemism by taking up anew the criticism of the facts gathered by Spencer and Gillen in their beautiful book on the central tribes of Australia.

The *Année philosophique* comprises studies by M. BROCHARD, *L'œuvre de Socrate,* by M. HAMELIN, *Sur la logique des Stoïciens,* by M. ROBIN, *Le traité de l'âme d'Aristote,* by M. DAURIAC, *Essai sur la catégorie de l'être,* and by M. PILLON, *La critique de Bayle, critique du théisme cartésien.* The French bibliography for the year 1901, which is entirely the work of M. Pillon, contains not less than one hundred and five works. This is more than we mentioned in our "Correspondence" for that year, but I have no reason to regret the omissions. I am compelled to choose among many works which are not at all deserving of the same degree of attention. My principal object is to review philosophical questions in connection with a few important books, so far as this is possible for me.

But I shall add several names to my list taken from the bibliography above mentioned: ARVÈDE BARINE, *St. Francois d'Assisse et la légende des trois compagnons* (Hachette, publisher); H. BREMOND, *L'inquietude religieuse, Aubes et lendemains de conversion* (Perrin, publisher); CHARLES BYSE, *Le prophète du Nord, vie et doctrine de Swedenborg* (Fischbacher, publisher); G. FULLIQUET, *Les expérience religieuses d'Israël* (*ibid.*); JEAN RÉVILLE, *Le quatrième èvangile son origine et sa valeur historique* (Leroux, publisher); M. MURET, *L'esprit juif* (Perrin, publisher); E. FAGUET, *Problème politique du temps présent* (A. Colin, publisher); and last but not least, the beautiful work of M. E. BOUTMY, *Essai d'une psychologie politique du peuple anglais* (A. Colin, publisher).

LUCIEN ARRÉAT.

PARIS, FRANCE.

CRITICISMS AND DISCUSSIONS.

THE CONTRARY AND THE CONTRADICTORY IN BIOLOGY: A STUDY OF VITALISM.

The continued and frequent discussion quite recently of the subject of Mechanism and Vitalism indicates that the problems involved, notwithstanding their fundamental theoretical importance for the biological sciences, are either not yet satisfactorily solved, or, as also may well be the case, are misconceived and misstated. This state of affairs is due, we believe, to the fact that purely methodological principles are not taken into sufficient consideration in the attempts to reach a solution. This view is confirmed in the instance of a work before us,[1] where both a clear analysis of the nature and a consistent and systematic treatment of the problem are absent, notwithstanding that much of value is presented. Once prior recognition of the importance for the problem of considering methodological principles is made, the same length of discussion and criticism that are usually connected therewith would not be necessary.

In justification of our statement we find that, for instance, Bütschli, after admitting the existence of no essential difference between neo-vitalism and vitalism, since for him both are characterised by the acceptance of the presence in the organism of a special "prinzip" or "force" or "Geschehensgesetzlichkeit," wholly absent in inorganic things, states that both views also admit the validity of a *causal* (kausal-mechanistisch) construction of life phenomena; for both agree in making "vital force" the *cause* of these phenomena. Accordingly on the basis of fundamental methodological principles we find that, if the presence of this special "causal-acting," "law-following" vital force is the essential and specific attitude of the organism, then vitalism in no way contradicts mechanism (i. e., the theory and laws of energy) or makes impossible the application of its principles to organic phenomena, but on the contrary not only that the two theories are quite compatible and both can be true at the same time, but that vitalism must in fact even be subsumed under mechanism.

The ground for this assertion lies in the general logical doctrine of classification, of which there are two well-known methods, viz., logical and dichotomous, or

[1] *Mechanismus and Vitalismus*, Bütschli, Leipzig. 1901. 104 pp.

disjunctive. According to the former two or more classes are subsumed under a genus as coördinate species upon the basis of certain both common and different (resp., *conferentia* and *differentia*) yet in each case *positively* characterised qualities, giving, according to strict logical terminology, *contraries*; in the second method the differentia of one or more of the coördinate species are determined *negatively* with reference to those of another, forming *contradictories*, of which there can be only two. In this procedure that class or those classes which are characterised *negatively* in the dichotomous division must prior to this be recognised as different from the others upon the basis of *positively* existing attributes, i. e., they must be proven to be really existing classes upon another basis than that of the negation of that of which they are the contradictory. It is evident from this, then, that in each case the classes are subsumable under one and the same genus which is made up of the conferentia that exist side by side with the either positively or negatively presented differentia.

There is a distinction, therefore, between contraries and contradictories; the former affirm the essentiality of definite positive yet different attributes for two or more species; the latter negate this essentiality for one or more classes of attributes which are necessary for another. As examples of the two we have, as contraries, the members of the color series, red, blue, violet, etc., lines straight and curved, showing, as above stated, that they may be many or reduced to two; as contradictories, monovalent and non-monovalent atoms, red and not-red things, straight and not-straight lines, prime and not-prime numbers, *showing that the negative class would, if the positive characterisation were made of it, really include or be identical with one and in some cases many classes, i. e., contraries.* But according to both methods, however, the species are coördinate because of the existence of conferentia, as, in the examples, of valence, color, line, and number; i. e., the contradictory of straight, not-straight, does not include everything except a straight line, as, e. g., Galileo, Sistine Madonna, Arion, Perseus, etc., but only curved lines, which form the contrary.

These principles of method, *first*, that in the case of both contraries and of contradictories conferentia exist which form a genus, so that *genus and species cannot possibly contradict*, and, *second*, that it is *always possible to convert the logical into the dichotomous division* by passing from the positive to the negative determination, *from the contrary to the contradictory, and vice versa*, these principles should be continually borne in mind in the examination of the arguments for a "vital force" and in our own attempt to make clear the nature of the problem of the relation of vitalism to mechanism.

As preliminary to the application of these principles we must, however, establish as clearly and definitely as possible the meanings which, whether from logical necessity or from pure arbitrariness, nevertheless as a matter of fact, attach themselves to the forms we shall use; for *mechanism and vitalism can be contrary to or contradict each other provided only that they are related as coördinates and*

not if the latter is subordinate. Both of these latter relations might, however, exist at the same time were one of the terms ambiguous, having a narrower and a broader meaning, as is to a certain extent the case with mechanism, and could the assumption of a "vital force" be really justified. However, to investigate the grounds which are offered as demanding such an assumption and to show that after all the conclusion from these is an *invalid* immediate inference and so to demonstrate the real nature of the origin of vitalism, this forms a large part of our discussion.

Bütschli does not admit the existence of any ambiguity in the term *mechanism*, but *distinguishes it from mechanics*; the latter is the science of the phenomena of "equilibrium and motion" (p. 7), i. e., kinetic energy; the former is more general; it means to "understand" and "explain" upon the basis of the *necessary* assumption of a *causally* and *uniformly* acting something (*Geschehenswesen*), and he derives from this the adjective *mechanistic*. We are of the opinion that the distinction here made is one not always recognised, and thence comes the possible ambiguity of the term mechanism. However, it corresponds essentially to that made by many recent authors between Energetics on the one hand as genus, and the sciences of the various energies, e. g., Electrodynamics, Thermodynamics, etc., on the other as species, i. e., between the science of the common qualities of all the energies, chemical, "distance," osmotic, kinetic, as genus, and the special sciences of each one of these as species. The conferentia of all these specific energies, i. e., of energy, are the *interdependent attributes of regularity and uniformity, causality, conservation, "equalisation of uncompensated potential differences,"*[1] *"shortest time," "greatest working,"* and, as empirical investigation has shown, *dissipation*, i. e., increase of *entropy*. *Mechanism can be identified with Energetics* in this above meaning and so distinguished from mechanics, and if we do this we have at the same time made clear the logical necessity (*Naturnothwendigkeit*) and justification of accepting the above attributes as making up the meaning of mechanism: for these attributes are, at least some of them, fundamental, ultimate, lying at the basis of and conditioning any science of nature, and without them no "understanding," no "explanation" is possible. Making this identification the result is, in accordance with our methodological principles, that vitalism, if it means the theory of a "vital force," supposing this to be justified, can neither contradict nor be contrary to mechanism, but only to mechanics, the science of the specific energy of moving mass-points, and to the sciences of the other energies, any one of which, according to the methodological principle we have stated, may be either contrary or contradictory to the others according as a positive or negative determination is made; i. e., the contradictory of mechanical, non-mechanical, includes, and can be converted into, as contraries, all the other energies, electrical, chemical, etc., and vital, too, if it exists, as can also non-electri-

[1] See Ostwald in various places.

cal, and so on in turn, so that *vitalism stands logically as a contrary obtained by converting the contradictories of each of the other energies*.. However, this is in itself by no means a proof of the existence of a "vital force," but nevertheless these relations should be especially remembered in endeavoring to find any justification of the theory. From the above it is again seen that vitalism must also be subsumed under mechanism, as follows also from certain other admissions of the vitalists, as found stated by Bütschli, viz., that events in the organism are *quantitative* and take place in entire agreement with the law of *conservation*, and that the "vital *force*" is conditioned by and transformed out of and into the other energies.

The above seems to us to be the only possible logical relation consistent with methodological principles which a "vital force," providing it were first unquestionably proven to exist, could bear to mechanism on the one hand and to mechanics and the other specific sciences on the other. While, therefore, our argument has thus far been largely *ad hominem*, the important question remains to be decided *ad rem*, as to whether there is any justification for the acceptance of the existence of yet another distinct energy form, and to ask if it is not perhaps rather the result of an *invalid conclusion* from the impossibility of proving, e. g., "A" in detail on one side, i. e., from the "not-proven" or "unproven," to the "proveness" that "A" is *not* and so from this to the proven existence of the contrary "B" on the other.

The dispute centers therefore first about the possibility or impossibility of completely explaining (*begreifen*) the organism upon the basis of the at present generally accepted energy-forms, and so again demands a preliminary definition of terms. First, the meaning of the term *cause* is to be made clear, for even the vitalist considers his vital force to be causal. We find that our author (p. 10) distinguishes two kinds of causes (*a*) a "working" and (*b*) an occasioning (*auslösende*), besides (*c*) also conditions, for every event. To the first of these he makes the quantitative identity implied in the principle of conservation applicable, but he fails to realise that the other two, occasioning cause and conditions, are also ultimately reducible to the first, that they are also in turn only effects of "working" causes. Second, the concepts "describe" and "explain" are to be considered. Here our author (p. 14), reverting somewhat to Kirchhoff finds that "description" means to present (*aufzählen*) the spatial and temporal contiguity of things and events; that explanation also does this, but in addition thereto attempts to discover relations of causality, thereby becoming "causal description." But although this distinction is valid and our author has already expounded "causality" to us, he does not in any way suggest a practical criterion for the discovery of such relations, but, as so many scientists and philosophers before him have done, begs the entire question in the assertion, that when one event follows another with *logical and empirical necessity* then the first is the *cause* of the second: for the very essence of the question here is, how can *such a necessity* be brought to light? Nor is this criticism of Bütschli rendered invalid by his second definition of explanation

viz., that it is *subsumption*, for, as we indicated in our discussion of methodological principles, this is conditioned by the existence of *causal* relations, i. e., the first kind of explanation. Therefore a real practical criterion for detecting causal relations and so of explaining is not offered by Bütschli. That, however, there is such a criterion, viz., the quantitative identity existing between events which is implied in the fundamental attributes of mechanism or energetics, and that the discovery of its importance and its use by the physicists has been a chief factor in the development of modern science, this we would emphasise as bearing directly upon the question of the possibility of *explaining* the organism. Explanation is, we must conclude, the establishment of relations of cause and effect among phenomena, which relations are characterised and discovered by the presence of a quantitative identity and its implications, these relations and characteristics not being themselves explainable but only constitutable.

Can the organism, then, be explained? One thing is certain, and that is, that it cannot be unless the factors which condition or are identical with explanation elsewhere, viz., mechanism, its implications, and its subordinate energies and the *essential* characteristics of each, are also made use of here. But it must also be admitted that direct quantitative determinations cannot be made in the organism to the same extent at least that is possible elsewhere. This brings us in a way to the *crux of the matter*, to the question as to whether or not this impossibility of making as detailed and complete quantitative determinations of organic events as we can of inorganic prevents the subsumption of the organism under mechanism, and if it furnishes valid grounds for concluding to the existence of a "vital force." In answer to the first part of the query we may cite examples of the practice of those sciences which for the most part only describe things in their spatial and temporal contiguity and offer few "causal descriptions on account of the complexity of conditions, etc. Thus geology and mineralogy do not for such reasons in any way deny the validity of the principles of mechanism and the laws of the specific energies for their phenomena, but, on the contrary, recognising the impossibility of proving this by direct investigation for every detail of not only "prehistoric" events but also of present occurrences on account of their complexity and extent, accept the validity and make all possible use of both the general causal principles and the specific causal laws for all phenomena in their respective fields of research, and admit that everything takes place in full agreement with these and as a result of the coexistence of the at present accepted energy forms, of whose modes of action these specific laws are only expressions. It is in this way, for instance, that geology calls to her aid both chemistry and physics.

It is evident that here we again have to deal with a methodological principle which we may state as follows: that, as a result of that unity of all the sciences which comes from their being phylogenetically dependent on the same psychological (*Kausalitätstrieb*) (cf. Plato and Aristotle) and factually on the same logical conditions, viz., the assumption of the uniformity of an independent dynamical

principle in nature, and consequently in accordance with the principle of analogy (the ultimate method of all induction) that the laws and conclusions of any one science are extended in their application to every other science which deals, if only indirectly, with the phenomena dealt with directly by the first, and that these laws retain their validity in this extension until contradictions thereto appear as a result of independent investigations in this new and special field.

There would seem to be no reason then why biology, as one of the inductive sciences, should not proceed according to the same principle and therefore take the position that, in the first place, although the validity of the general and specific laws of the at present known energy forms cannot in every case at least be proven in every detail for the organism, nevertheless these laws hold good in every instance for these forms wherever found in the organism until this validity is done away with by independent investigations in this field of phenomena; and in the second place that these are the only energy *forms* which can legitimately be considered to to be present in the organism until there is other evidence for new forms than that only of the impossibility of the above-mentioned *detailed* experimental proof. A complete *explanation*, i. e., deduction according to cause and effect, of the attributes of the organism from these of the energies not being possible, *description* must be appealed to, but the assumption of a "vital force" is not justifiable on this ground alone, though the *possibility* of its existence is therefore not to be denied, for, to put it technically, from the "unproveness" (incomplete proof) of "A" we cannot infer the "proveness" of the contradictory "non-A" and so the contrary "B," but only also the "*unproveness*" of the "non-A." Nevertheless upon this form of a *false* inference, as was before suggested, rest practically all the arguments of the vitalist for his theory.

There may be however from another quarter more serious objections to the possibility of *explaining* the organism than those so far discussed, viz., our as yet incomplete knowledge of chemical and physical phenomena themselves. Is this fact in itself a valid reason for accepting the existence of our hackneyed vital force? In answer to the first suggestion it is self-evident that where explanation ends in the one case it must also end in the other, but that of itself does not prevent a reduction of all physiological events to mechanism as we *now* conceive it and in the way we have above expounded. It perhaps goes without saying that there is no such thing as an ultimate explanation, but only a relative which consists in reducing certain facts of experience to others that in turn cannot be further reduced. What these ultimate elements are is the point of dispute between the "mechanical heory of the universe" and energetics, the one holding that *all* events in nature are motion, the other that *some* such events are not of this kind; therein lies the absolute contradiction between the two. However in either case all explanation becomes, as Kirchhoff pointed out, ultimately only *description*, but before we get to this we have what we call *explanation*, so that our question is: must we not accept this for the organic world also? In answer to the second question above the

same reply as was previously made must be repeated. The possibility of new energy-forms being discovered always remains, but one cannot validly conclude from that possibility and from incompleteness of detailed knowledge to the actuality of a new energy (vital force). Rather only when, having demonstrated conclusively by a process of exclusion the impossibility of reducing organic phenomena to the at present known energies, i. e., having a definite disproof of this reduction, and so having assumed that a new form exists, this energy can be measured and its factors given, (as in heat energy temperature and specific heat) then alone shall we be fully justified in accepting its existence as proven. How openly the vitalist, however, sometimes begs the question is seen from assertions like Bunge's (Bütschli, p. 16) that all those partial phenomena of organisms which can be understood (*begriffen*) physico-chemically are really not life-phenomena, and like Cossman's, that even a body made artificially out of the same stuff as plants and of the same structure would nevertheless not be an organism.

To give a more detailed statement of such a method we find that Bütschli suggests an as exact and complete study as possible, first, of the physico-chemical character of those "stuffs" which form the material basis of the simplest organisms, and, second, of those finer structure and form phenomena in the inorganic field which occur under known conditions and yet most closely resemble organic phenomena. We should then by a process of exclusion, consisting in showing that only under these conditions and under no others can the organism have arisen and continued to exist, show the unity of the organic with the inorganic. Such a method he thinks would also show definitely to what energy categories organic phenomena belong, and would prove more fruitful than the study of the simplest elementary life phenomena of growth, metabolism, etc.

It is not to be supposed that the vitalist is wholly ignorant of this method, for he is not; on the other hand he holds that its application shows him that there remains something which cannot be explained thereby, viz., the *form* of the organism and also its outer and inner *organisation*, both of which he claims can be understood only teleologically. The justification of this claim is therefore to be questioned. Bütschli's answer thereto is, that certain organic forms in both relatively static and in dynamic cases are undeniably dependent on the same factors as are the inorganic equilibrium forms of liquids and solutions, and this is confirmed by the results of some of the most recent investigations, as, for example, in artificial parthenogenesis and the development of double embryos. "Forms" are not lacking in the inorganic realm, and it is one of the fundamental principles of mechanism that "*equilibrium*" *is everywhere sought* and therefore that all the at present known energies are at least "form-conditioning energies." A specific "form energy" is to be assumed only on the conditions above expounded as proving such assumptions, and these we find warrant perhaps the acceptance of such an energy; for since the form of a body does not change unless work is done upon it, i. e., except by the use and transformation of energy, we must accept the existence of a

"form-energy" as a result of the law of conservation. But again this energy is quite as universally characteristic of the inorganic as the organic and cannot therefore distinguish one from the other or be the vital-form-energy which the vitalist is seeking. Nor can we see that Bütschli's above reply is incompatible with his subsequent statement "that the complex organic form arises in a manner which is without analogy in the inorganic realm, i. e., it develops," or that this places him in the ranks of the vitalists, as Renike has claimed. For it is certain that a "peculiarity" implies necessarily "something without (complete) analogy"; in the case under discussion the "forms of the phenomena of development" are in some respects certainly unlike "inorganic" forms; so that the "peculiarity" becomes a species-building characteristic. It might be as well one of the many differentia of inorganic bodies, for they also have peculiarities due to varying and different energy-complexes, but this does not prevent our discovering similarities, or analogies if one will, and subsuming them under the general principles of energy. "Without analogy" therefore does not mean without any but only "without *complete* analogy," and so implies a certain unity or similarity which shall be the very basis of the subsumption we are seeking. One must recognise that it is impossible to do away with the real peculiarities of anything, for these are facts, but we can, letting these stand, ask whether they are not the result of the coexistence of the energies we now have and perfectly compatible with mechanism in its present extension of meaning. It seems to us therefore that the vitalist, in concluding from the application of the methods we have just above presented that there is a vital force, does so because he has not really carried these methods to the limit of their valid application.

The same methodological position applies also to the question of organisation. (Cf. Bütschli, p. 72). Both organic and inorganic are organised, each individual in each realm in a way peculiar to itself, but the *fact of organisation* is at least common, and may consequently be in both cases *dependent on the same ultimate factors*. Bütschli finds that two types of organisation are distinguished by biologists, viz., a "maschinelle" (machine) and a chemical. The first of these is a concept which is derived primarily by the consideration of and abstraction from the parts of a machine and then applied by analogy to the highly complex and also simpler organisms. The difference here is at best one of degree only, and (p. 73) is ultimately dependent (in part) on a different chemical organisation; for that certain characteristics of inorganic bodies are so dependent is universally proved and accepted; viz., color, transparency, polarisation, cleavage, form of crystallisation, etc.: in the organic some if not all of these are present and therefore in agreement with the principles we have stated are to be considered as likewise so dependent. But for the organism there has been claimed in addition to these also a peculiar *structural* organisation of the "*ultimate vital elements*," such as "plasomes" (Wiesner), "biophores" (Weismann), "pangenes" (de Vries), in the assumption of which we find only question-begging epithets and a circumvention of the prob-

lem; for that which is even put in question, viz., the existence of a vital force, is assumed without proof in these names.

It is nevertheless doubtless correct that the individual characteristics of the organism are dependent upon the "maschinelle" structure of the cell in so far as this is a complex of nucleus, centrosomes, cytoplasm, etc. (cf. Bütschli, p. 76); yet so are the characteristics of a galvanic cell similarly dependent upon its various parts, but this does not in itself mean the presence of differentia which are not reducible to our present energies. Likewise the question must be raised in the case of the organic cell as to what the ultimate nature of the nucleus, centrosomes, or plasomes, biophores, etc., is. To stop with them as *vital* is to beg the question. Admitting the existence of such units and the fact of their *chemical* organisation, this latter, though it be peculiar to itself in the same way as is every chemical compound in its structural formula, is to be conceived of only as in agreement with chemical principles and therefore with mechanism (energy). Such a "peculiar" (i. e., individual) chemical organisation together with the other energies necessarily coexisting with it (form, volume, heat, electrical, and perhaps osmotic) (cf. Ostwald), therefore conditions all the external manifestations and relations of the organism in a way quite analogous to "peculiar" inorganic instances. Here again we are arguing by analogy, but only such analogy, i. e., "similarity in diversity" or "identity in difference," as lies at the basis of all reasoning in the inductive sciences, as we have before pointed out. For example in chemistry, every structural formula is in some respects different from every other and so peculiar to itself; by *analogy* it is accepted as valid for all molecules (groups of) manifesting the same characteristics as those bodies from the study of which it is obtained; and by *analogy*, i. e., because of the similarity it bears to other formulæ in the matter of valence, etc., it is brought under the same *general* principles of chemistry and mechanism as are other structural formulæ. Biology must use the same method of procedure, and doing so and letting the peculiarities of the organism as a whole stand, but demonstrating the similarity of each one of these to those found in the inorganic world, ultimately show if possible that the at present known energy-forms suffice to account for the organism, and if not, in just what respect the insufficiency consists. Certainly neither the form nor the organisation can be held at present to form such an exception.

Lotze admitted that an accidental (*zufällig*) origin of the organic from the inorganic was conceivable for the simplest though not for the higher organisms, from which he implied, making "purposeful" identical in meaning with the contradictory of accidental, i. e., non-accidental, that there is in the higher forms at least a "force" which accounts for their purposefulness. Bütschli himself holds that the direct origin of organic forms out of inorganic, which forms should be capable of further development, is thinkable, although these forms would not be identical with the simplest forms which we know to-day; such an origin however does away with a force or energy distinctly vital. Bütschli, to answer Lotze, recognises the neces-

sity of first establishing the meaning of the term "accident." He considers correctly, we think, that this concept does not exclude causality and regularity, but that it means an event which cannot be predicted or whose exact connection with other events cannot be shown on account of the complexity of conditions, etc.; i. e., notwithstanding incomplete knowledge and the absence of definite measurements, causality and the other principles of mechanism are still looked upon as holding good for these events. The inorganic world is therefore both accidental and non-accidental, and causal, and whatever the origin of the organic world may be, either accidental or non-accidental, in neither case is anything implied either for or against the existence of a vital force, for this latter would in any case be causal, etc. Consequently to think to support its assumption by identifying *non-accidental* with purpose is to make use of a manifestly invalid inference. For in the first place the *possibility of prediction* with which Lotze would be *obliged* to identify it is quite the opposite of that which is usually accepted to indicate purpose, and in the second this latter concept is used without first ascertaining its exact meaning, and if it is not really quite as compatible with accidental as with non-accidental and in any case with causality.

Admitting a purely physico-chemical origin for the simplest organisms, this explanation would, from the facts of organic continuity and development, apply also to the higher organisms and the processes of reproduction and development upon which their evolution is dependent, even though these processes are without *complete* analogy in the inorganic realm. Yet it is because of the seemingly extraordinarily purposeful and complex nature of at least these higher organisms that a metaphysical or teleological principle has been assumed and its function ascribed to a vital principle, a *Zielstrebigkeit*, a *Bildungstrieb*, etc. (cf. Bütschli, p. 29). Thus the step from purpose to vital force is made, which step would be valid only providing the presence of purpose were really proven to be a universal characteristic of the organism, this purpose could not be explained on the basis of our present energy-categories. The criticism which we find in Bütschli on this point is in general excellent, although in certain details open to objection. He finds, first, that the idea of purpose (teleology) is primarily derived from certain of our own psychical states (p. 29) and, second, that it has only a psychological and subjective but no universal objective validity. "End" is the general concept of something willed and implies the choice of, if possible, suitable, though sometimes of what proves to be unsuitable means for its realisation. The act is said to be purposeful especially when the desired end is attained, otherwise not. Accordingly the consciousness of the end or motive seems to be a psychical ground or cause for the purposeful act. Consciousness, therefore, and its correlate, a highly developed nervous system, seems to be a condition *sine qua non* for such acts (p. 29), for in order to be able to judge an act, an event (*Geschehen*) as purposeful, the *consciousness of an end* is the primary essential, for the attainment of which end the act is a means. In the inorganic realm, therefore, the assignment of ends is entirely arbitrary and

unjustifiable, for here the essential condition, consciousness, is absent, and the only assignable purpose for an event, if one will insist on using the term, is that it should happen. This necessity of the presence of consciousness for purposeful action even in the physical (inorganic) world has usually been recognised by all the philosophical writers on the subject, but they, as we also find some biologists doing nowadays, have also always attempted to evade the difficulties inherent in such an attempt by a logomachy; they have made such a *consciousness unconscious* in its nature, thereon constructing a *contradictio in adjecto*; nor have they denied its compatibility with mechanism.

The conclusion from this is then that the concept of purpose cannot have a meaning for the organism in its entirety, for certainly not every part of this has a conscious side; the most one can do is to say that its end is that it should persist and not die, at least until it has reproduced itself. The same might be said in part of a planet system, where, however, it is evident that any so-called "final cause" is identical with efficient causes, and therefore in a way superfluous, having only a subjective but no objective basis.

"Purpose" may seem to be more evident, however, in the "services" which a single organ performs for the entire organism, but here as elsewhere the assertion of purposefulness is a conclusion reached by assuming the existence of something analogous to the conditions for our own so-called purposeful acts, where really no basis for such analogy exists. It seems, therefore, that the presence of "purpose" is certainly not a universal characteristic of the organic realm, and that it consequently cannot be used in support of or identified with the long-looked-for vital force, which must at least be coexistent with the entire range of the organic.

On the other hand, to attempt to show that purpose is contradictory to mechanism is impossible for the very reason that our analysis and criticism of the former concept assumes the compatibility of the two as necessary; for our own "purposeful" acts, being conscious, depend, if we accept the theory of psychophysical parallelism, upon purely *mechanistic* (physiological) factors, a position which would not be altered even if the existence of a "vital force" should be proven on other grounds. If one and the same act is therefore both purposive and mechanistic, these can be only two different points of view. The former is, like the concept of the beautiful, a purely subjective, incomplete standpoint, oftentimes invalidly identified with indeterminism; the latter, that of mechanism, is an objective, ontological, explanatory, epistemological category, an ultimate and universal principle of all knowledge of nature, as we have previously indicated. They are two distinct principles of classification whose application does not necessarily lead to contradiction, any more than would weight and color if used as principles for classifying objects. This view of the matter is taken by the biologists themselves, e. g., Pflüger, who inculcated it in his *teleologisches Causalgesetz*, in which both purpose and mechanism are implicit, and Bunge, who according to Bütschli, admits that everything in the

organism, except the psychical, is "mechanistisch." Bunge, however, is a vitalist in a peculiar sense, as is seen from his statement that "the essence of vitalism consists in starting from the inner world," "the known," and that "in activity lies the secret of the organism," in which statements he identifies the vital force with consciousness, which should account for the purposefulness considered to be present. To be consequent, then, Bunge would be obliged to make consciousness coexistent with life and so swallow the "unliquid draught" of unconscious consciousness. In Reinke we meet an interesting modification of the argument for a "peculiar something" in the organism. (Cf. Bütschli, p. 103.) According to this author's theory of "dominanten," the distinguishing characteristic of the organism is a *Maschinenstructur*; in a machine there are *Kräfte* which *link* the energies there present together and *direct* them to a *certain end*; these forces are the expression of the intelligence which was necessary in making the machine and can be interpreted only as unconscious intelligence (Reinke, '99, p. 113), i. e., conscious intelligence in the maker becomes transformed into unconscious in the machine. Such "dominanten" in the organism therefore should *direct* its phenomena and distinguish it from all inorganic nature that is not applied by man in his engineering products. In this theory we again meet the view that *purpose* demands intelligence of some kind, but here it is supposed to "link" and to "dominate"; but on the other hand, the doctrine of the *transference* of the intelligence making the machine to the machine itself is something quite new, and, we think, invalid. It implies a "conservation" or transformation of consciousness, which in a way contradicts the dualism upon which the theory rests principally, for *conservation* means *correlation* among different energies, which on the psychical side is impossible if dualism is true, and *vice versa*. Reinke's theory contains therefore a certain *contradictio eo ipso*.

At the conclusion of our inquiry in which we have considered, we believe, all the typical arguments for a "vital force," the following summary of the status of the problem seems to be justified. The strife between the two views of vitalism and of "non-vitalism," i. e., mechanism in its present extent of meaning, will probably continue until the time is reached when every detail of life phenomena is known and can be measured and predicted. For in the first place, while there is yet such a lack of knowledge of detail, there remains always the possibility of new energies being discovered, and the vitalist overlooks the fact that even if they were they could not contradict or be contrary to mechanism, but only to mechanical (kinetic) and the other energies. This results from the principle that only coördinates but not subordinates can exist in either of these relations. This being so, the possibility of passing by conversion of the contradictory of each one of the energies, non-kinetic, non-chemical, etc., to "*vital*" as the *contrary* always exists. This possibility is in itself, however, not a proof of vitalism, but indicates only the relations which would really exist were proof from an independent source offered and at hand. But the typical vitalist uses it, perhaps unconsciously, in concluding (inval-

idly) from the lack of complete proof that the organism is made up only of our at present known energies, i. e., from "A" to the contradictory proposition "non-A," that the organism is *not* so made up, as proven, and then by concluding by conversion of "non-A" to "B," the contrary, that a vital force exists. This reasoning is *invalid* for the reason that from the *unproveness* of "A" *only the unproveness* and not the proveness of the contradictory "non-A" results, e. g., if it is not (un)proven that two lines are *equal*, their inequality also remains unproven; on the other hand, if the supposition of their equality were *disproven*, then their inequality would necessarily follow. So likewise if the assumption that the organism is a complex of only those energies which we now accept were definitely *disproven*, then, by virtue of the same relations of contradiction, we would all have to accept the existence of a "vital force," although we would perhaps know nothing *about* this and have no *confirmation* of its existence until its factors, etc., were discovered. But not one of the factors considered by the vitalist to furnish such a disproof because of their being supposedly irreducible to our energy categories has stood the test, for it has been possible to show by that principle of identity in difference or of analogy which underlies all inductive method that these factors are so reducible. On the other hand, that there is *confirmation* of the vitalist's claim, no one would venture to assert. It is then the use of the principles of the contrary and the contradictory and based upon this the *invalid* inference from the incompletely proven, i. e., the unproven, to the proveness of the contradictory and then, by conversion, of the contrary, that *characterises*, we believe, *all the arguments for a vital force*. This reverses the direction of the valid use of the principles of classification we have expounded, the correct practical use being first to confirm the existence of a vital force and then to place it in its proper position in the classification.

However, we find that in the absence of a detailed proof and explanation of the organism as made up of our at present known and definitely confirmed energies certain methodological principles having to do with the range of validity of a law compel us to accept such a dependence for the organism. From this standpoint, then, the organism is to be considered as a peculiar complex of energies, all of which are found elsewhere in various coexistences and relations to each other and therefore conditioning various peculiarities, but nowhere else do they present the same peculiarities as does this peculiar complex, the organism, present. Chemical, electrical, and osmotic changes, surface tension, movement, etc., are all found elsewhere, but only all together in the organism. Equilibrium is here always sought and gained, causes becoming effects with no loss of energy and in the shortest time, i. e., the organism is a mechanism. Vitalism at present, then, remains without justification, and its assumption can be the result only of the ignoring of methodological principles and consequently of invalid reasoning.

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SEMITIC ORIGINS.[1]

Semitic Origins!—a title which at once challenges not only our curiosity but also our attention. All we know so far about the Semites was that they invaded Babylonia in prehistoric times, coming probably from Arabia, their original home. When invading Babylonia they found there a religious system, social forms and governments which were the highest possible, and which they—the Semites—accepted in course of time. Whether the Semites brought with them some ideas of their own as regards their religion and social forms nobody, so far, has been able to tell us. Barton's book, therefore, would be a most valuable contribution towards the study of religions—not only of the Semitic but also of the Sumerian—if he had shown us or presented to us the specific Semitic and Sumerian elements in the religion to be found in Babylonia.

Barton discusses in the first chapter of his book the "*cradle of the Semites*" and finds, p. 28, that we must hold to the Arabic origin of the Semites. From these Semites as a whole parted the northern Semites—the Babylonians, Aramæans, and Canaanites—settled in Babylonia and the neighboring regions, where they lived together for a long period. The Aramæans were the first to separate from the main body of the emigrants; at a considerably later period the Canaanites, and, last of all, the Assyrians."

Do the inscriptions testify to the accurateness of this statement? Partly they do, and partly they do not. In the oldest Sumerian inscriptions we find traces of Semitisms—hence Semites must have been in Babylonia as far back as our inscriptions go: these Semites are rightly called by Barton the Semitic Babylonians. At about 3000 B. C. we hear however of certain gods who are not mentioned in any of the older inscriptions. These gods are Nergal, Ninib, Nusku, Nabu, and especially Dagan and Marduk. At the time of the first dynasty of Babylon, which is of Canaanitish origin, Marduk had become the chief god. Hence the second Semitic invasion goes back to the period before the time of "the kings of Ur and of the four corners of the world" or 3000 B. C., and is a Canaanitish one. The Aramæans were not known in Babylonia till about 1500 years later.

The second chapter is devoted to the discussion of the "primitive Semitic social life." What we learn about it is this (p. 79):

"The Semites, perhaps as early as the time of their separation from the Hamites, had reached the animistic stage of culture, and formed totemistic clans. Their family relations were exceedingly vague. Marriage was formed for a short term, women resided in the homes of their own kindred, and descent was reckoned

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[1] *A Sketch of Semitic Origins Social and Religious* by George Aaron Barton, A. M., Ph. D. Associate Professor of Biblical Literature and Semitic Languages in Bryn Mawr College. New York: The Macmillan Company; London: Macmillan and Co., Ltd. 1902. Pages xvi, 342.

through them; the killing of female infants created a paucity of women, which produced a condition of polyandry resembling the Nair type. At the same time there was much sexual irregularity, which was regarded as innocent. Out of this there grew, through the formation of male trading clans and the influence of the capture of women, a system of Thibetan polyandry and, later, a system of male kinship."

As already stated above the oldest Semites are the Babylonian Semites. They had accepted the Sumerian pantheon, for we find that even in those inscriptions which were written in the "Semitic style," Sumerian names for the gods are used. Now it happens that there exists in the Sumerian pantheon a *well defined genealogy*—hence we have in this divine genealogy or pedigree, in this "heavenly society" a reflex of the conditions of the society as it existed upon earth! Upon earth a man had a wife—hence a god had a wife. As human parents had children, so gods could have children. If descent was reckoned among the people through the *father*, it is natural to suppose that this was transferred to the gods also; if on the other hand, descent was reckoned through the *mother*, we must find in the genealogy of the gods also this latter custom. Indeed, we find *both* reckonings. Of the seven *sons of Bau* and Nin-Mar-ki the *daughter of Ninâ*, descent is reckoned through the *mother!* Enzu and Nin-Girsu are the *sons of Enlil;* Ud is the *son of Enzu:* descent is reckoned through the *father!* The fact that original attributes of Ninlil were in course of time *deified* and became separate goddesses—all however being conceived of as wives of Enlil—shows that there existed *polygamy*. Also polyandry was practised. Bau was the wife of Enlil, but she marries every year Nin-Girsu, the god of rain—hence Bau has or may have two husbands!

Furthermore we know that both Bau and her husband Enlil were "the first-born of Anu"—hence there was a time when the brother did and could marry his sister. At the time, then, when the "divine genealogy" originated all these practices must have been in vogue. But even this is not all. We know from historic inscriptions how new gods came into existence. Sargon I., Naram-Sin, Gudea, and especially Dungi "King of Ur and of the four corners of the world" made themselves or were made "gods." Now it happens that just these kings are *Semites*, hence this "*making*" of gods may be called *Semitic* in at least this sense that it was practised by Babylonian Semites *also!* What was the mode of procedure in creating such new gods?

Although we do not as yet know the reason or underlying principle which justified in each case such a step, yet this much we can say:

1. That those kings had *temples* built in their own honor;

2. That they placed their own *statues* in those temples;

3. That certain *sacrifices* were to be *offered* to their statues on certain specified *days*, which sacrifices were presided over by priests created especially for this purpose;

4. That in at least one case a month was called after and dedicated to such a new god (itu Ezen ^{dingir}Dungi);

5. That their names were prefixed by the sign for "god," i. e., he was transferred to the "heavenly" spheres and thus identified either with a certain part of the cosmos (cf. UD, ZU, Innanna), or with a star (Bur-Sin became the "star" AMAR-UD);

6. That new proper names came to be used in which this or these new gods formed an important element (cf. Ur-^{dingir}Dungi).

Taking all these facts into consideration, the process in the creating of such new gods is probably to be conceived of as follows: whenever a king or a patesi thought he had sufficient reason to warrant his becoming a god, he first of all had a statue of himself made, put this statue in a temple, either of another god (Gudea), or in one especially built for the sheltering of his "other self" (Dungi), and commanded that sacrifices be offered to "his double." The statue in this wise acquired with the temple a "place," i. e., KI, or an "abode," i. e., UNUG, upon the earth—hence we have such names as Enlil-KI = place of Enlil; Uru-unug-KI = the abode of Sin (upon) the earth; Innanna-unug-KI = the abode of Ishtar (upon) the earth. The *original* signification of the KI, the "determinative of place," at the end of these words, therefore, was that the "abode" was to be sought upon the "*earth*," in the *terrestrial* world. A "god," however, does not belong to the *earth only*, but he must have his dwelling-place in the *heavens also*, hence,—as the *heaven* is that which is *above*, and as *above* is expressed by *AN*, and as such opposed to KI or earth, which is below—it happened that such a god became the sign AN prefixed to his name. The terrestrial Gudea, became a heavenly Gudea, i. e., an *AN Gudea*, and as such read ^{dingir}Gudea, i. e., ^{god}Gudea. This process of transferring the terrestrial to the heavenly went in course of time so far that even the rivers of Babylonia, the Tigris and the Euphrates, and Babylonian cities[1] were supposed to have their heavenly counterparts, yes, the heavenly became in every respect a reflex of the terrestrial. Therefore, if we want to learn something about the ancient Babylonian world we must look up to the heavens: they *reveal* everything to us. And what they reveal is this:

Heaven and earth are *one*. They form the "firmament"; the heaven is the *upper* or AN and the earth is the *lower* or KI part of this firmament. This AN-KI, this "world" is a reflex of the "world" of the early Babylonians. This latter "world" was the valley between the Tigris and the Euphrates—hence Babylonia *must* consist of two parts too, and it does! They are Ki-en-gi-ki-BUR-BUR = Shumer and Akkad, i. e., the *low* and the *high* land![2] If there be an AN-Enlil, there also must be an Enlil-KI, if there be an AN-Ud, there also must be an Ud-(unug-)KI, etc. If AN-Enlil was the *father* of AN-Uru(ki) and AN-

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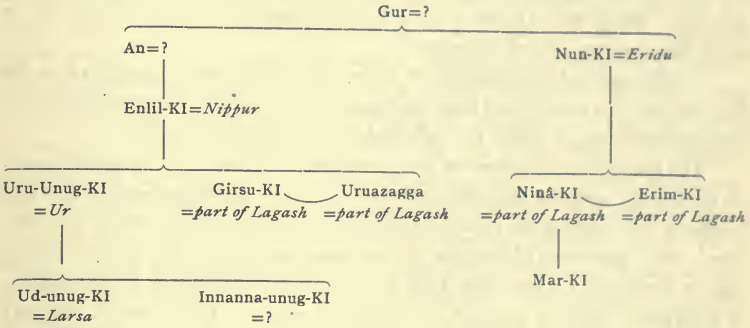
[1] *E. B. H.*, p. 161, note 1.

[2] Cf. here *Upper and Lower Egypt*, *Israel and Juda*, etc., etc.

Nin-Girsu it is evident that Enlil-KI must have been the father of Uru-(unug-)KI and Girsu-KI. But Enlil-KI is = Nippur, while Uru-(unug-)KI or Girsu-KI are = Ur or Girsu (Lagash). From this it follows that Nippur was older than Ur and Girsu and that the latter two were thought to be the children of the former, i. e. that they were founded by or were colonies of Nippur.

The genealogy of the oldest gods of Babylonia given in my Creation-Story, p. 61 (= *The Monist*, XII., p. 620), becomes thus a genealogy of the *political development* of Babylonia, which when expressed in the form of a pedigree would be the following:



The abode of AN was probably Ki-an-KI (i. e., the territory of An-KI; *E. B. H.*, p. 134) = (or?) Erech (Unug-KI, i. e., the abode κατ' ἐξοχήν). The city of Gur I would like to identify with Nisin (or possibly also Erech). The fight of Marduk and Tiâmat would thus become a fight between Babylon and Nisin (or Erech). This latter supposition is admirably borne out by the dates of the kings of the first dynasty of Babylon, in which Nisin appears to be the arch-enemy of Babylon.

The pedigree of the political development of Babylonia must again represent a *human* genealogy, for the cities where those different gods were worshipped were not founded by gods, but by *men*. Hence the "god of Nippur" or Enlil must originally have been a *human being* who founded that city and called it "after his own name": Enlil-KI. The "origins, social and religious," from this standpoint would be as follows:

1. Enlil, the son of AN, founded a city and called it "after his own name," Enlil-KI.

2. Enlil the founder of Enlil-KI became thus the *guardian* of Nippur, and in course of time by means of ancestor-worship also the *god* of Nippur. From this resulted the idea that with the founder or guardian or god of a city the city stands or falls—if the god was left in his place, the city retained its independence; if, on the contrary, the god "left the city," i. e., if he was carried away captive, the city ceased to exist.

3. As god he was transferred to the "upper" world; he became an AN-Enlil, i. e., ^{dingir}Enlil.

4. This transference was applied to all the other founders of Babylonian cities. The founders were members—either brothers and sisters, fathers or sons—of a *human* society. This *human* society by being transferred to the heavens became thus a *divine* society, i. e., the oldest human became the oldest divine *genealogy*.

5. Just as *Babylonia* developed, so, it was thought, the *whole world* developed—hence the "*genealogy*" (originally human, later on divine) became a "*cosmogony*," and as such a reflex of the political development of the "*world*" of the early Babylonians, i. e., of *Babylonia*.

6. The political development of Babylonia having been transferred to the heavens can thus be gathered from the heavens again. From this resulted astronomy and astrology, in which the Babylonians were especially famous.

The heavenly or upper world is thus a reflex of the lower or terrestrial world. In the former, then, we can find portrayed the exact conditions—social and religious—as they were at the time when this religious system was in process of formation. The "genealogy of the gods" is complete, however, in the earliest inscriptions so far found, i. e., at about 5,000 B. C., at which time already we find Semites in Babylonia, who had *adopted* this *religious system*. The Sumerian theogony or cosmogony can, therefore, be called a Semitic theogony and cosmogony, at least in so far as it was adopted and appropriated by them. If, however, it be asked whether this system can be called the reflex of the social and religious life of the Semites *before* they had invaded Babylonia, i. e., of the *primitive* Semites when still living in their cradle-land Arabia, we must confess that we *do not know!* Hence it is at the present impossible for us to talk about *Semitic Origins!* We first of all ought to find out something about the *historical* Semites. If we would know something about them—so far it is very little—then let us wait till a primitive Semite speaks to us. As long as we have no documents written by primitive Semites, all we may say on this subject is, at the very best, only guesswork!

In the third chapter Barton discusses "the origin of Semitic religion." As a basis for his discussion he takes the, no doubt, very correct proposition that "the religious conceptions of a people are expressed in forms which are modelled, in large degree, on the political and social institutions" (p. 82). Barton however comes to a conclusion quite different from the one at which we arrived (see above). This is due simply and solely to the fact that he first of all builds up a theory of his own and then tries to force the different gods into this theory. In his attempt at doing this there may be detected on almost every page of his book misstatements, misquotations, grammatical errors, too much trust in other authorities, and superficiality. Criticism, however, must not be negative only but also positive. This commands me to illustrate my assertions. Passing Barton's explanation of the phrase

"to know good and evil," I shall confine myself here to the "*transformations*" discussed in chapters IV. and V.

Barton's theory is that each and every god of the Semites is or was developed out of a "woman," a "mother-goddess." This mother-goddess, he thinks, was Ishtar, who was a "never failing spring or springs, and that some sacred tree to which the spring gave life represented her son," i. e., Tammuz (p 86). Ishtar becomes thus a goddess of *fertility*. All the other gods he tries to connect in some way or another with *fertility*, thus making them "women." To these "women" are reckoned among others even Bêl, the old Enlil, and Jahveh! But now *ad rem!* Page 128 we are told that Ilmaqqâhu "the divine protector"—thus read and translated by Barton—displaced Athtar. Ilmaqqâhu is a protector of children and a giver of fertility—hence an attribute or epithet of Athtar! According to the *translation* given, Barton sees in אלמקה only *two* elements, but according to his *reading* there ought to be *three*, viz.: אל + מק + ה; מק he takes as a Piel-form of מקו or מקי and reads and translates: maqqâ = protector. But this is no grammar. Suppose we had the √ מקו, we could only translate "god protects him." Barton ought to have been aware that the Piel-form of מקו could only be מקי = maqqaja, hence the name ought to have been written אלמקיה. But it is written אלמקה, hence the root cannot be מקו but must be למק. אלמקה therefore can be read only either Almâquhu (= broken plural) or Almaquhu (= elative). That this latter reading is to be preferred I have shown in my Creation-Story, p. 66, note (= *Monist*, XIII., p. 112). Almaquhu is the god of rain, lightning, etc., and as such a god of fertility, etc.

On page 222, note 6, he wants us to believe that Ashur can be derived from Ishtar according to "grammatical rules," invoking for the assimilation of a "t" to a preceding "sh" such an authority as Delitzsch, *Gram.*, § 51, 2. Delitzsch quotes here the "vulgar Assyrian" forms asakan, asarap, etc., as having arisen out of ashtakan. But this is impossible! ashtakan can become only altakan, *never* asakan! The development of asakan is this: atshakan, atsakan, assakan, asakan, cf., shalatshunu, shalatsunu, shalassunu, shalasunu, quoted by Delitzsch, *Gr.*, § 51, 1. The rule is: the "t" of the "t"-formation is put *before* the first radical in verbs beginning with צ, ז, ס, and ש in Vulgar-Assyrian. Cf. also the forms: tidûku for ditûku, tizkâru for zitkâru, etc., on one hand, and on the other: bishshash = pitshash; eshshu = edshu; shishshu = shidshu, etc. in K. B. VI[1], p. 412. These *latter* forms might possibly have been invoked by Barton, but *never* the former.

On page 260, note 6, Barton wants to improve upon Jensen (K. B. III[1], p. 54), but utterly fails. The passage is taken from Gudea, Statue F, I, 12–II, 4. Col. I, 1–7 contains the common formula of dedication, so often used in cylinder inscriptions. With l. 8 "galu" begins a relative construction, indicated by the A in the verbal forms. The final verb is contained in II, 4. 5. The whole passage should be read and translated (against Amiaud, Jensen, Thureau-Dangin, Barton) as follows:

8.	galu nin-du-e pa-ne-ud-du-A	*who* executeth that which is becoming,
9.	E-ninnû ^{dingir}Im-gig-ghu-bar-bar	*who* the Eninnû, etc.
10.	^{dingir}Nin-Gir-su-ka	of Nin-Girsu
11.	mu-ru-A	has built
12.	^{dingir}Ga-tum-dug	*who* for G.
13.	nin-a-ni	his mistress
14.	Shir-pur-la-^{ki}	in Sh.
15.	uru ki-ag-ga-ni-ta	her beloved city
16.	te-unug SHUZ(!)-za-A	an abode has splendidly erected
II, 1.	mu-ni-tu-da-A	he whom she has born:
2.	E ^{dingir}Ga-tum-dug	the temple of G.
3.	nin-a-na	his mistress
4.	ru-ne	he built it
5.	shà nu ma-shi-tur	and (her) statue he brought into it.

In l. 16 therefore there is not the *slightest* trace of khallabi. For SHUZ = nasâku II^1 see H. W. B., p. 472, and Br. List., No. 3019 = herrlich, prächtig, herrichten. For the NE = "it" in II, 4 see Statue B viii, 49: Sin, his name, nobody opens *it* (gab—NE); *ibid.*, IX, 5: by (!) the gods so and so his fate *it* may be changed (ghe-dá(!)-kur-NE). Hastiness in Barton's work may be detected:

(1) On p. 205, where B. tells us that we have in iv R 1, col. II, 23–28, the expression AM-A-A dingir EN-LIL and AM-A-A dingir NIN-LIL, i. e., "the mother-father Enlil" and "the mother-father Ninlil." But Enlil and Ninlil are followed here by the postposition GE, hence we have in the Assyrian translation "sha ilu dito." From this it follows that neither Enlil nor Ninlil are an AM-A-A, but ^{dingir}EN and ^{dingir}NIN are the AM-A-A of Enlil and Ninlil respectively. AM-A-A is simply the Sumerian mode of expressing our word "parent"; cf. Sum. "water of heaven" = rain; "water of the eyes" = tear, to cry, etc.

2. P. 193 and note 3: Not Nin-Girsu but Ur-Nin-Girsu means husbandman. B. quoted here Br. List. N. 10,995 without verifying the references! See Creation Story, p. 66, note = *Monist*, XIII., p. 112; Del. H. W. B., p. 58; Brünnow, List No. 11,267.

3. P. 207, note 9: Not gishgalla but im(!)-gishgalla is = shûtu = south.

It would lead me too far to quote all passages belonging to this class, as UD-UD for utu ud-du-ta, p. 182, 2, etc., etc. Barton is not acquainted with the early Babylonian inscriptions, is therefore obliged to put too great a trust in his authorities. On p. 198, on the authority of Jastrow's *Religion of Babylonia and Assyria*, p. 64, he makes the statement that the wife of Ea does not appear in the older literature. If Barton had taken the trouble to look up the references given in E. B. H. *sub* Ninki and Damgalnunna, he would have found several places where the goddess occurs. Jastrow in the German edition of his *Religion* used E. B. H. to better advantage. See Jastrow, *l. c.*, p. 63, 5–6, and comp. E. B. H., p. 81, note 1, and p. 224. If Barton mastered the old Babylonian literature, he

would have been aware that the inscription CTBM, Pt. V, No. 12,061, quoted by him p. 193, note 4, was published also by Winckler in his A. B. K. No. 4 and translated by me in E. B. H., p. 117. By looking up these references B. will find that there is nothing to be found in the inscription about Nin-Girsu's being called a "god of life"! P. 212 B. tells us that Nabu does not appear in extant inscriptions till the time of Khammurabi, but see Scheil, R. T., xix, p. 48, and E. B. H., p. 229. The Canaanites began to invade Babylonia sometime before 3000 B. C. Nabu being a Canaanitish god, it is probable that that inscription may belong to the dynasty of Isin. On page 188, note 9, B. translates an inscription published in CTBM, Pt. V, No. 12,218. B. apparently did not know that this inscription had been published elsewhere and has been translated by Jensen, K. B., III^1, p. 68, ii, and by me in E. B. H., page 37. Or, if B. did know that that inscription had been translated already, and only wanted to improve upon the translations extant, does he really think that the ancient Babylonians would commit to writing such an inscription, where neither the name of the dedicator nor the god to whom the inscription was dedicated are given? The person dedicating is Bau-nin-a-an, i. e., either: "Bau is the mistress of rain" (because she is the wife of the god of rain: Nin-Girsu) or: "Bau is mistress indeed," but *never* "Bau lady of heaven"! The god to whom she dedicates the inscription is Nin-lil (?), her mistress. The translation of this inscription throws a welcome light upon Barton's competency in translating Babylonian inscriptions.

On p. 206, note 1, we have another exhibition of Barton's ability. Here he has left out just the most important thing of the whole sentence: the verb. For a translation cf. E. B. H., p. 76, and p. 81, note 1. In Sumerian a sentence *never* ends with a postposition, but with a verb. The crowning point of Barton's knowledge in reading and translating Sumerian inscriptions is to be found, however, on p. 193, note 1. (= Gudea, Cyl. B. X, 3–8).

For gishtin-a-da read zal-^{sum}-da; da = postposition; sun = CHI + A = collective sign, which is, by the way, not given in Price's List. For gishtin-tin-a-da read kash-^{sun}-da. For uz azag uz ga gu bir-mir read uz-azag uz-ga-nag (! = sucking kids, E. B. H., p. 343, 8) URITSU alim-^{lu} (cf. Cyl. B, viii, 5: URITSU^{lu}-alim-MA!). The determinative lu = צאן = sheep, may stand either at the end or at the beginning of a word, cf. E. B. H., p. 206: kur-gig-^{ghu} and ^{ghu}-kur-gig! For alim = kusariqqu see Jensen, K. B. vi^1, p. 311 f., H. W. B., p. 345, and Jensen, Kosm. pass. For uritsu, E. B. H., p. 347, 12. Uritsu^{lu}alim (not identified by Price!) = "young rams"; Barton makes them to be "THE DRINK FROM THE ASSES OF MOTHER NIN-GIRSU"!!! Am^{dingir}Nin-Gir-su-ka can only mean "mother of Nin-Girsu,"—at least according to Grammar, which, however, does not exist for Barton. For E-shi-a-mus read E-ninnû-a-mush. For en imir siba bir-mir read en alim-^{lu} sib URITSU alim-^{lu}. For mi-ni-da mu-na-da dib sum read me-ni-da mu-na-da-dib-e. For the meaning of this latter phrase, "upon his command (Gudea) caused to take," instead of Barton's "he raised, he lifted up, he brought, he presented it,"

see Thureau-Dangin, ZA.XV, 1900, p. 55. A few minor points ought to be mentioned. Barton says, p. 218: "There is no direct evidence in the inscriptions as to whether Nidaba was masculine or feminine." But see Creation Story, p. 27 = *Monist*, XII, p. 594, note 6. Page 213, note 5, we find in Barton's book a translation of a E. A. H. tablet. As the original is not accessible to me, I cannot point out the different misreadings. However, col. III, 3 must be read—as far as I can remember that inscription—Ur-a-pa-azag-a (instead of Barton's lik-a-gar-a). Barton's translation of that inscription I cannot understand. Who can? Page 189, note 7: In Cyl. A, xxiv, 6 we read: ^{dingir}Ba-u zi (life) -shag (heart) -gal (having), i. e., "Bau who has life within her," and not, "chief mistress." How Barton together with Davis quoted on p. 190, note 5, can find in Cyl. A, xxiii, 5: ^{dingir}LAM EN ^{dingir}Nin-gish-zi-da dumu-ka An-na-kam "a Ningishzida brother of Bau," I fail to see. See also Creation Story, p. 17, 12 = *Monist*, XII, 584. To Barton's discussion of the meaning of NIN see my Creation Story, p. 11 ff. (= *Monist*, XII, p. 578). On what authority does Barton claim (p. 188, note 1) for "dam" the meaning "lady"? Where is it said that EN-GIR-SI is = NIN-GIR-SU, as Barton, p. 193 wants it? Nin-en (p. 188, note 7) does not mean "supreme lady," but "mistress of the priests," i. e., "high-priestess," Creation Story, p. 25, 8 (= *Monist*, XII, p. 25). Gudea did not place in the temple which he built for Ninâ "the image of a lion." Here (p. 188, note 8) Barton misread the mà-magh for ur-magh! For a translation of the inscription see E. B. H., p. 193. Ships were often built in honor of gods: E. B. H., pp. 275, 2; 255, 9 *et passim*.

On p. 182, note, Barton is bold enough to say that my reading of the goddess Ishtar as Innanna is based upon Thureau-Dangin. Of course, but Thureau-Dangin as well as I know that such a reading is justified by Br. Mus. 82-8-16,1 (= Abel-Winckler, *Keilschrifttexte*, p. 54) l. 18: en-me INNANNA | en-me-e In-na-an-na-ku | e-nu sha ^{ilu}Ishtar. See also Jensen, K. B. III^{1}, p. 20, note 4. Barton apparently never knew that such a reading was possible. In conclusion, a few words about the inscription of Lugaltarsi, of which inscription, Barton, p. 182, note, says that Thureau-Dangin as well as I "have missed the significance of the same." Barton gives a new translation on p. 181. Against that translation is to be said:

1. "King of the countries" is an attribute of Enlil, E. B. H., p. 131, l. 2.

2. This attribute when deified, i. e., when written ^{dingir}Lugal-kur-kur, became a proper name of Enlil, E. B. H., p. 132, l. 14.

3. Its feminine counterpart is nin-kur-kur, and *this only* is used as attribute of Innanna, Creation Story, p. 20, note 11 (= *Monist*, XII., p. 587). Hence "King of the countries" cannot be the attribute of Innanna or Ishtar.

4. On two places ^{dingir}Innanna has the double postposition after it (Creation Story, p. 13, 3, 4 = *Monist*, XII., p. 580), where we therefore *must* translate according to grammar "the goddess of Innanna." Barton ought to have been a little more careful in his assertions.

Many other statements might be brought in, but this will suffice. Barton's

book, no doubt, testifies to great diligence, but his imperfect knowledge of Sumerian grammar and inscriptions would naturally debar him from treating such a difficult subject as the "Semitic Origins."

HUGO RADAU.

CHICAGO, ILL., March 3, 1903.

SCIENTISTS OUT OF PLACE.

[We publish Mr. Paul R. Shipman's criticism of Dr. Alfred Russell Wallace because we feel that his vigorous onslaught hits our own position. To be sure we do not endorse Mr. Wallace's spiritistic tendencies nor his theory of the limits of the universe, but we believe that science and philosophy are so intimately interrelated that every scientist in order to be efficient must be a philosopher and every philosopher ought to be a scientist, or at least ought to be thoroughly familiar with scientific methods and keep abreast of the progress made in the several branches of scientific investigation. In fact our chief aim consists in building up a philosophy of science.—P. C.]

The distinction between science and philosophy, though generally recognised, is not always observed. "Philosophy," it has been said, "is the science of sciences," and the definition is perhaps as good as any other of the terse explanations of this kind of knowledge. Broadly speaking, it is the business of science, in the common acceptation of thinkers, to ascertain and classify facts; while to coördinate and unify the results of science, speaking in like manner, is the business of philosophy. Qualifications for the one, so far from being qualifications for the other, are disqualifications, rather. Science deals with concrete things, and calls especially for observation, experiment, and a mind wide open. Philosophy deals with abstract things, and calls for reason, speculation in the best sense of the word, and a mind not only wide open, but world-wide. Rarely are these two sets of qualifications in a high degree united in the same person. The philosopher who invades the province of the scientist is in danger of leaving it with hypotheses instead of facts. The scientist who invades the province of the philosopher, though he may gratify "the unskilful," is pretty sure to "make the judicious grieve." As a rule, accordingly, it would be well, I think, if scientists kept to their respective departments, and philosophers kept on their Alpine height. *Ne sutor ultra crepidam.* Let the scientist stick to his part. Let the philosopher stick to the whole.

These reflections seem germane to the much-published speculations of Dr. Alfred Russell Wallace on the limits of the universe, which he places at its visible horizon, identifying incredibly the universe of stars with the material universe. Emerging from his special department as a naturalist, he has made an excursion through the visible universe, it appears, and has returned with the twofold conviction that the visible universe constitutes the totality of things, and that it not only was created, but was created peculiarly for "the production and development of man," who is, he says, its "sole and sufficient result." This assuredly is "perilous stuff"—less perilous to him within his bosom than out of it, where, paradoxical as

it is, the "written troubles" of his brain will do him the most harm. The philosopher's fundamental conception is infinity, abstracted from the universe, wherein it is concrete. Imagine a philosopher who turns the constellation of Orion into a mile-stone on a highway to the limits of the infinite—a highway leading out of everything into nothing. Hudibras doggerelises, with an ironical sigh:

"Ay me! what perils do environ
The man that meddles with cold iron."

The twin author of the theory of natural selection probably thinks by this time that these are slight compared to the perils that

do environ
The wight that meddles with Orion.

Already at the mention of his name people the world over are shrugging their shoulders. Astronomers turn their backs upon him. Scientists of all descriptions, including those who might have gone off on the same speculation themselves if they had thought of it, are falling foul of him. Thinkers in every sphere look down on him. Even the level-headed "man in the street" joins in the general concert of veiled contempt. No wonder. As a scientist Dr. Wallace, although not a giant, is of distinguished stature; as a philosopher or speculative thinker, he is a pigmy. Nor in this respect does he stand alone in his class. The same in somewhat less degree may be said of some other distinguished scientists (not to mention the run of undistinguished ones), who ever and anon leap up out of their specialties, like fishes into the air, apparently under the delusion that they can support themselves in the rarer medium above their proper element. Let them in the future take warning from this Icarian flight of the most venerable and not the least accomplished of their number.

In his own department a scientist of this kind is or may be the right man in the right place—a round peg in a round hole. Out of his own department he is a round peg in a square hole. It needs only common sense to perceive that he is out of place.

Edgewater Park, N. J. Paul R. Shipman.

BOOK REVIEWS.

AN ESSAY ON LAUGHTER. Its Forms, its Causes, its Development, and its Value. By *James Sully*, M. A., LL.D. New York, London, and Bombay: Longmans, Green, and Co. 1902. Pages, xvi, 441.

When we consider that man is the only animal that laughs we must grant that a philosophical discussion of the form, the causes, the development of the value of laughter treats on one of the most serious and most important questions; and the author, Prof. James Sully, one of the leading psychologists, is fully aware of the gravity of his subject. Man has been defined as a tool-making animal, as a speaking animal, a reasoning animal, and a laughing animal. Does that not indicate that the faculty of laughter is of equal dignity with man's rationality, his language, and his industrial ability?

Professor Sully is "ready to challenge the wisdom claimed by the out-and-out sticklers for seriousness," the agelast (*ἀγέλαστος*), the laughter-hater (*μισόγελως*). He quotes Pascal without endorsing him, "*Diseur de bon mots, mauvais caractère.*" The friend of laughter (*ὁ φιλόγελως*) has always existed and, claims our author, "we all shrink from the 'awful imputation' implied in the words 'you have no sense of humor.'"

Professor Sully discusses his subject gravely as behooves a scientist and a scholar. He anticipates the criticism to which he lays himself open for investigating the topic, for to some people all audible laughter is a display of ill-breeding, and Lord Chesterfield congratulated himself that nobody had ever heard him laugh.

The book before us is pretty voluminous, consisting of 432 pages and being divided into twelve chapters. Having called our attention to the fact that a laugh is a bodily act, he warns the reader not to fear allusion "to such unmetaphysical entities as lung and diaphram," whereupon he proceeds to discuss the nature of the smile and the laugh, which he claims to be identical in all essential details. Tickling is the most common purely bodily cause of provoking laughter, and so a whole chapter is dedicated to its characterisation. We are now prepared to learn something about the physiological basis of laughter concerning which our author says:

"It is conceivable that the disposition to laugh may have its own restricted physiological conditions in a special instability of the mechanism concerned. This again may presumably include some as yet undefinable property of the nerve-centres which favors rapid change in the mode of brain activity, and those sudden collapses of tension which seem to be the immediate physiological antecedent of the motor discharge in laughter."

In the description of the varieties of the laughable (Chapter IV.) and a criticism of the theories of the ludicrous, our author exhibits much learning and sound judgment. Kant and Schopenhauer offer sufficient material and there is no gainsaying Professor Sully's condemnation of their stilted explanations:

"The impressions of the laughable cannot be reduced to one or two principles. Our laughter at things is of various tones. It gathers up into itself a number of primitive tendencies; it represents the products of widely removed stages of intellectual and moral evolution."

And now Professor Sully proposes his own views and sets forth a summary of his own work:

"It will at once be evident that a large investigation into the origin and development of the laughing impulse will take us beyond the limits of pure psychology. We shall have to consider how the impulse grew up in the evolution of the race; and this will force us to adopt the biological point of view, and ask how this special group of movements came to be selected and fixed among the characters of our species. On the other hand, laughter is more than a physiological and psychological phenomenon. As hinted above, it has a social significance, and we shall find that the higher stages of its evolution can only be adequately dealt with in their connection with the movement of social progress.

"Lastly, it will be by tracing the evolution of laughter in the human community that we shall best approach the problem of the ideal which should regulate this somewhat unruly impulse of man. Such a study would seem to promise us a disclosure of tendencies by which laughter has been lifted and refined in the past, and by the light of which it may consciously direct itself in the future."

Professor Sully is an evolutionist and so he goes back to the brute to explain the human, and seeking in the lower animals that function which would correspond to the smile of man, discovers it in the display of a lively satisfaction in general. He argues as follows:

"We cannot accept common modes of interpreting the 'mischievous' performances of animals. Many of a monkey's tricks are 'funny' enough; yet we may seriously doubt whether he enjoys them as practical jokes. His solemn mien certainly does not suggest it; but then it may be said that human jokers have a way of keeping up an appearance of gravity. A consideration of greater weight is that what looks to us much like a merry joke may be a display of the *teasing* instinct, when this goes beyond the playful limit, and aims at real annoyance or mischief. The remark probably applies to some of the well-known stories of 'animal

humor,' for example, that of Charles Dickens about the raven. This bird, it may be remembered, had to share the garden with a captive eagle. Having carefully measured the length of this formidable creature's chain, he turned to good account the occasion of the giant's sleep by stealing his dinner; and then, the rightful owner having presumably woke up, made an impudent display of eating the same just safely outside the eagle's 'sphere of influence.' This doubtless showed some cunning, and something of spite; but it is not clear that it indicated an enjoyment of the fun of the thing.

"That this teasing and playing of tricks by animals may now and again approach the human attitude of malicious mirthfulness is not improbable. A cat that 'plays' with its captive mouse, half-pretending, as it seems, not to see the small thing's hopeless attempt to 'bolt,' may, perhaps, be enjoying something of the exultant chuckle of a human victor.

"Yet, while we may question the truth of the proposition that these mischievous actions are enjoyed as practical jokes—in the way in which Uncle Remus represents them—we need not hesitate to attribute to animals a simple form of the child's sense of fun. This trait appears most plainly in the pastimes of the young of many familiar species, including our two domestic pets, pastimes which are quite correctly described as animal play.

"Darwin has rightly recognised a germ of our 'sense of humor' in a dog's joining in the game of stick-throwing. You throw a bit of stick for him to fetch, and having picked it up he proceeds to carry it away some distance and to squat down with it on the ground just before him. You then come quite close as if to take the stick from him, on which he seizes it and bears it off exultingly, repeating the little make-believe with evident enjoyment.

"I have tested a dog again and again when playing with him in this fashion, and have satisfied myself that he is in the play-mood, and knows perfectly well that you are too; so that if you pretend to be serious and to command him in your most magisterial voice to give up the stick he sidles up with a hollow show of obedience which could impose on nobody, as if to say, 'I know better: you are not really serious; so I am going on with the game.'

"G. J. Romanes relates that he had a dog who went some way towards qualifying himself for the office of clown. This animal would perform a number of self-taught tricks which were clearly intended to excite laughter. 'For instance, while lying on his side and violently grinning, he would hold one leg in his mouth.' Under these circumstances 'nothing pleased him so much as having his joke duly appreciated, while, if no notice was taken of him, he would become sulky.'

"The anthropoid apes appear both to produce a kind of smile or grin, and to utter sounds analogous to our laughter. It may, however, be contended that this so-called laughter is much less like our laughter than the grin is like our smile."

That laughter is inherited and not due to imitation is shown by the case of "Laura Bridgman, who was shut out by her blindness and deafness from the lead

of companions. She developed these expressions. We must conclude, then, that they are inherited tendencies."

Professor Sully claims priority for the smile; he says:

"It is fairly certain that laughing comes after smiling.

"The first laughter is, like the smile, an expression of pleasure. As Preyer puts it, the laughter is a mere heightening of the look of pleasure. It marks, however, a higher level of agreeable consciousness."

"In the absence of better evidence, the fact that the smile appears first in the life of the child must, according to a well-known law of evolution, be taken as favoring the hypothesis that man's remote ancestors learned to smile before they could rise to the achievement of the laugh. This is further supported by the fact that, in the case of the individual, the laugh when it occurs announces a higher form of pleasurable consciousness, the level of perception as distinguished from the level of sensation which is expressed by the first smile. Lastly, I am informed that among imbeciles the smile persists lower down in the scale of degeneration than the laugh."

The origin of laughter according to Professor Sully would be as follows:

"A baby after a good meal will, I believe, go on performing something resembling sucking movements. The first smiles may have arisen as a special modification of these movements when there was a particularly lively feeling of organic contentment or well-being. I believe, further, that an infant is apt to carry out movements of the mouth when food is shown to it. A similar tendency seems to be illustrated by the behavior of a monkey which, when a choice delicacy was given it at meal-time, slightly raised the corners of the mouth, the movement partaking of the nature of 'an incipient smile.' Again, our hypothesis finds some support in the fact that, according to Preyer and others, the first smiles of infants were noticed during a happy condition of repletion after a good meal.

"Supposing the smile in its origin to have thus been organically connected with the pleasurable experience of sated appetite, we can easily see how it might get generalised into a common sign of pleasure."

It is perhaps difficult to understand how the lungs and diaphram can become connected with a smile and how tickling can be the most primitive bodily cause of it, but Professor Sully is ready to produce instances from the animal world; he says:

"A young chimpanzee when tickled for some time under the armpits would roll over on his back showing all his teeth and accompanying the simian grin by defensive movements, just as a child does. A young ourang at the Zoölogical Gardens (London) behaved in a very similar way. The young of other animals, too, betray some degree of ticklishness."

At any rate "laughter which accompanies tickling and other closely allied forms of play in children owes its value to its being an admirable way of announcing the friendly playful mood."

But what is tickling? Professor Sully answers.

"Children only laugh in response to tickling when they are in a pleasurable state of mind," and this "seems to confirm the hypothesis that the love of fun, which is at the bottom of tickling and makes it perhaps the earliest clear instance of mirthful play with its element of make-believe, first emerged gradually out of a more general feeling of gladness."

These arguments contain the most original part of the author's contributions to the philosophy of laughter; the rest of the book is devoted to a series of topics which are applications of the author's theory and contain many interesting points; Chapter VII., "On the Development of Laughter During the First Three Years of Life"; Chapter VIII., "The Laughter of Savages"; Chapter IX., "Laughter in Social Evolution"; Chapter X., "Laughter of the Individual: Humor"; Chapter XI., "The Laughable in Art: Comedy"; Chapter XII., "Ultimate Value and Imitations of Laughter." Professor Sully concludes his volume with an expression of fear that laughter might die out (we must consider that the book was written in England at the time and soon after the close of the Boer war), but he puts his trust in the growing volume of what he called "private laughter."

"It is not unlikely that in the future, men who think will grow at once more tenacious of their ideals, and more alive to the ludicrous consequences which these introduce....If a few men will cultivate their own laughter in this way and do their best to make their private amusement that of an inner circle of friends, we may hope that it will not die—though the death of what we love were less terrible to face than its debasement—but be preserved by a few faithful hands for a happier age. They will have their reward in advance, since pure and honest laughter, like mercy, blesses him that gives, and him that takes."

Is it necessary to add, that with all deference to the serious spirit of our author we do not feel satisfied with his explanations of laughter, fun, and humor. His essay is learned and commands our respect, but having devoted a careful study to his theory we can only repeat what Lotze said of Kant's doctrine of the ludicrous (quoted by Sully, p. 18), that he did not exactly understand why a funny idea should make us *laugh* rather than let us say cough, or sigh, or sneeze. We grant that the sucking movements of lips are made by babies as well as the lower animals when no longer really sucking and that they are accompanied by psychological states that are pleasurable, but they are not the germs from which laughter originates. The pouting of the lips can be observed in infants and children when they are intensely interested, intellectual tasting and testing is accompanied by the physiological symptoms of a material tasting and testing, but pouting never changes into laughing or smiling.

Do not our psychologists and philosophers seek far-fetched explanations for a phenomenon which is easily understood if we only analyse its physiological function and keep clearly in mind the psychical accompaniment? Is not laughing (as set forth in *The Monist*, Jan., 1898, Vol. VIII., No. 2, p. 261) simply a reiterated

shout of triumph? Laughing consists in quickly-repeated ejaculations, it is a heightening of man's activity in expressing his sentiments, a rapid breathing accompanied with vocal sounds, the very reverse to moaning which is a depression of the same condition. Moaning retards breathing and interferes generally with the respiratory organs. While it is true that smiling precedes laughing in the baby, we can see in a smile only the indication of a laugh, a kind of sublimated or spiritualised cachination. Tickling as a provocative of laughter is decidedly of a sensuous nature, indicating as it were the good-natured submission of the conquered one by the successful aggressor, both in combat and in love. This becomes apparent from many of the instances that Professor Sully adduces, especially also when a lady on referring to her childhood and speaking of the enjoyment of "this distinctly agreeable sensation of tickling," remarked that there was in it "a vague suspicion that the pastime was not quite proper." He further calls attention to the fact that is not unusual "of a child's refusal to be tickled by a stranger," and "tickling a child unexpectedly and from an unseen quarter will not provoke laughter."

While we do not agree with Professor Sully's theory of laughter, we confess that the perusal of his book was a genuine pleasure and the details of his discussion are both instructive and entertaining. P. C.

WHY THE MIND HAS A BODY. By *C. A. Strong*, Professor of Psychology in Columbia University. New York: The Macmillan Co.; London: Macmillan & Co., Ltd. 1903. Pages, x, 355.

GEIST UND KÖRPER, SEELE UND LEIB. Von *Ludwig Busse*, Professor der Philosophie an der Universität Königsberg. Leipzig: Verlag der Dürr'schen Buchhandlung. 1903. Pages, iv, 488. Preis, M. 8.50.

The title of Prof. C. A. Strong's book is somewhat misleading, for it seems to indicate that the author follows some Oriental doctrine of pure spirituality called 'mind," which is materialised or incarnated by assuming the bodily form of flesh and blood. Mr. Strong is no Vedantist, nor a believer in Mahatmans, but professor of psychology in Columbia University, and the work before us is a purely scientific investigation of the main problem of psychophysics, the relation between the states of consciousness and the functions of the brain.

Professor Strong says: "There are thus three distinct theories as to causal relations between mind and body: interactionism, asserting that the causal influence runs in both directions,—in sensation from the body to the mind, in volition from the mind to the body; automatism, maintaining that it runs in one direction only,—always from the body to the mind; and parallelism, denying all causal influence and holding the relation to be of a different nature." He adds: "From causal theories we must distinguish sharply the 'double aspect theory,' with its assertion of one reality manifesting itself under two diverse forms." This last theory presupposes the theory of panpsychism and apparently appeals to the author as best of all. Says he in the Preface: "That the panpsychist explanation is

clear to the bottom and altogether free from difficulties, I should be the last to pretend. But it rests on sound metaphysical principles; it enables us, as no other hypothesis does, to construe the facts; and its difficulties are of the nature of obscurities, not of contradictions....It enables us to settle the controversy between the interactionists and the parallelists in a way satisfactory to both parties."

The correlation between mental and cerebral functions is stated to be complete. "If there are mental functions which coffee does not stimulate or alcohol benumb, which remain unaffected by fasting and insomnia, they may be admitted to be without physical correlate. But since it is precisely the highest functions which these influences affect, this proves that what is higher, instead of being without correlate, is simply correlated with more refined mechanism. Indeed, if these functions were without physical correlate, why should they be brought to a standstill by the administration of chloroform? Why should not a person under chloroform still continue to judge, to feel pleasure and pain, and to attend? If, on the other hand, chloroform abolishes not merely sensations and images but the 'higher' states as well, does not this prove that all states without exception are physically conditioned?"

Prof. Strong will find that he is not just toward the founders of the theory of parallelism, for closely considered, it is identical with the double aspect theory. We only call his attention to Fechner's well-known simile in which the two series of mental and bodily functions are compared to the inside and outside curvature of a curve.

As to the several meanings in which the term soul is used, Professor Strong says:

"The metaphysical entity called a 'Soul' must not be confused with the 'soul' to which poets and religious teachers refer, nor yet with the 'soul' of empirical psychology and ordinary speech. If we understand by the word, as the Germans do, simply the mind or consciousness however construed, the soul in this sense is a fact, not the doubtful object of a theory. The soul, again, which is a man's most precious possession and whose loss is not to be outweighed by gain of the whole world, is not a man's mental substance but his better self. Even the soul as the subject of immortality is rather a man's consciousness than the mind-atom whose natural indestructibility is supposed to guarantee its continuance. Damnation of the mind-atom without damnation of the consciousness would be a very painless form of retribution, while eternity of the consciousness without eternity of the mind-atom should satisfy the most self-conservative.

"If theologians nevertheless cling to a Soul, it is partly because they deem it necessary to responsibility....

"Again, the Soul is needed as a storehouse for the memories and ideas when not actually in consciousness....

"Finally, to the eye of psychological analysis the thoughts and feelings may appear a bundle, and the mind to share in the mutability and transitoriness of its

states till these are given in charge of an underlying entity. Thus arises the theory that consciousness is a mere stream of phenomena; an activity, not an existence; the manifestation or efflux of a Soul."

In the present book our author is "solely concerned to disprove suppositious entities or principles, and thereby vindicate reality for consciousness itself. But," adds our author, "as I have discussed the matter negatively, I may be permitted to say a word about the positive side of the question....

"The alternative is *not* either to identify the Ego with objects of consciousness or to make it unknowable, but there is a third intermediate course: to make it experienced but not known. The key to the puzzle lies in the distinction between knowledge and experience. The Ego is the fresh experience as it comes, before we have had time to turn round upon it cognitively, and while we—that is, it—are engaged in cognising other things. Hence, on the one hand, the eternal behind-handedness of cognition, and, on the other, the possibility at the next moment of knowing this knower in memory. This is the solution of the puzzle about the Ego, and no other solution is thinkable."

The gap between the thinking subject and objective reality (he calls the latter things-in-themselves[1]) makes Professor Strong pause, but he bridges it, not by proofs, but by arguments *ad hominem*. He says: "Material objects, being immediately intuited, therefore exist as mental states. If there are realities outside the mind, they can be known only through the medium of our mental states, that is, representatively. Phenomenalism, or the denial of such realities, is a perfectly logical theory of perception; the fact that it makes objects cease to exist when we cease to perceive them being no valid argument agains it. But it gives us a mutilated and incoherent conception of the universe, and it leads logically to solipsism. To restore unity to the world, to fill out the causal order, to explain the evolution of minds, we must assume things-in-themselves."

Professor Strong offers the following theory as plausible: "Consciousness may itself be the reality that appears as the brain-process. This hypothesis would admit consciousness to a place in the causal order and guarantee its efficiency as surely as the other." Yet it "alone explains the connection of mind and body and the origin of mind. This hypothesis alone, by conceiving the relation between consciousness and other things-in-themselves as the counterpart of that between the brain-process and the rest of the physical world, admits consciousness to a place in the causal order without making it a form of energy. This hypothesis alone, by making the physical world disappear, so to speak, in the individual minds, offers us a monism of stuff as well as of form."

Our author is never dogmatic and so purposely uses the word "may." He finds difficulties in his solution which, though not insuperable, "may be sufficiently

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[1] We doubt the propriety of using the term "things-in-themselves" in the sense of objective reality. But the author's meaning is clear, and that is sufficient.

serious to prevent impartial readers from accepting the theory." To deal with the psychological problem properly, "it would be necessary to take, one after another, such forms of consciousness as memory, discrimination, perception, will, to analyse it, and to ask wherein its unity consists. All the difficulty is on the score of the unity."

Professor Busse treats the same subject but from a different standpoint, perhaps more ponderously and more thoroughly, after the fashion of a German professor. There is less hesitation in his methods, and he is very vigorous in his refutation and condemnation of adverse opinions.

Professor Busse compares the contents of his book to a *menu*, and offers as an *entré* the refutation of materialism.

Having reviewed in the introduction all possible standpoints: the materialistic-idealistic spiritualism, dualism, and parallelistic monism, he takes up with special delight the task of utterly overthrowing materialism.

There are three types of materialism in psychology: (1) The psychical is regarded as matter, or as a state or property of matter; (2) The psychical is regarded as a product of bodily functions; and (3) it is regarded as an accompaniment of physical conditions. Materialists, however, are not so clear in their distinctions as is our author. The three types are as a rule fused, and they themselves do not clearly know to which theory they owe allegiance. The refutation of materialism is done with a firm hand. Professor Busse asks us to consider what matter really is, and the answer is crushing. Matter is simply the contents of consciousness; it is nothing but a phenomenon given in consciousness. Accordingly, it presupposes consciousness. Ergo, consciousness cannot be either matter itself or the product of matter. In the same way, all other forms of materialism are successfully overcome. The psychical and the physical are so heterogeneous that consciousness cannot be a function or a product of matter. Their heterogeneity excludes any relation of cause and effect. If, however, the materialist regards consciousness as an accompaniment, he is no longer a materialist, but trespasses on the ground of the theory next to be considered, viz., the doctrine of parallelism. Obviously, the materialistic aberration is the most curious of all, for, says Lotze, "Nothing can be stranger for spirit than to doubt its own being, or to regard itself as the product of some external nature of which we know only second-hand."

Having digested the *entré*, we have now served the more substantial food of the *menu*, a discussion of the theory of parallelism. Their representatives are antagonists deemed more worthy of our author's steel. There is an empiric and a metaphysic parallelism, but neither of them can stand the close scrutiny of Professor Busse's critique. There is further a partial and a universal parallelism, a materialistic, a realistic-monistic, and a dualistic parallelism. Our author grants that the theory of parallelism possesses some advantages. It promises to satisfy the demands of the materialistic explanation of nature, and it remains in accord with principles that regard the whole nature as one consistent system of causation, sub-

ject to the law of the conservation of matter and energy. But in spite of it, the theory of parallelism is untenable; it is practically neo-Spinozism. In spite of the attempt to become monistic, it is practically a concealed dualism, or at least a combination of monism with dualism. Accordingly, it is inconsistent, and must be rejected. The idealistic-monistic theory of parallelism is superior; yet even in this higher form it cannot satisfy the demands of the critic, for in spite of its several advantages a psychical remainder is left to which we cannot assign a physical counterpart. This, of course, contradicts the demand of a thorough parallelism of the two series, and necessitates a new solution which he finds in his own doctrine, called *Wechselwirkungstheorie*, which means the theory of a reciprocal causal relation between spirit and matter.

This theory of a reciprocal causal relation satisfies all demands, and here Professor Busse rests his case. It is a return to the old position commonly regarded as surrendered long ago; but it is more natural and is not open to the criticism of artificiality, which is the fault of the theory of parallelism.

For a detailed justification of Professor Busse's theory in contrast to the many and various representatives of the parallelistic theory, we must refer our readers to the author's own explanations (pages 380–474). It ought to be regarded as the most important part of the entire volume, but it would lead us too far here to offer an exposition of his arguments. We can only say that our author weighs all objections in the balances of probability and none of them is deemed weighty enough to be regarded serious. Accordingly it is admitted as the only acceptable theory.

We have now only to turn to the desert of our *menu*, which consists of the *Weltbild*, or the entire world-picture, from which the *Wechselwirkungstheorie* has been sliced off. The physical world appears to be left to its own laws. It need not be interfered with. "Only when the development of a group of cells assumes definite forms, the psychic element appears; it does not come as a property or a product of matter or the forces of matter, nor as a summation or interpretation of atoms, nor as their inner aspect; it comes as something quite new; it is conditioned by the formation of this world of bodies, but it cannot be explained from it. For a physico-empiric consideration, it originates from nothing....That may be called a miracle, but one should consider, as says Stumpf, "that a miracle regularly repeated under definite conditions ceases to be a miracle and belongs to the category of natural laws." Whenever and wherever the conditions for the appearance of a higher psychic nature are given, there it appears, not as the product of a pre-existent spiritual stuff, nor by transformation or evolution, but by being added to it as something new demanded by the meaning of the whole, and as the fulfilment of definite conditions of spiritual existence." This is taken to prove that man has not risen from the anthropoid apes, but is an independent creation that appears in this world as something new. All new formations are qualitatively and specifically differentiated; nor can the human spirit, being spontaneity, be resolved into a psychic mechanism. A mental mechanism exists, but it is only one feature

of our spirit; man's mental mechanism is a tool, of which his spirit makes use as a means to an end.

In Professor Busse's world-picture, which he calls the idealistic-spiritualistic world-conception, the corporeal world disappears as such and becomes mere phenomenon; it is replaced by something spiritual. Here begins the province of the idealistic-spiritualistic metaphysics, and Professor Busse leaves the question open whether its problems will find their best solution in a monadological or in objective-idealistic metaphysics. Either has its advantages, and the two agree in all the main points, especially in this, that on their premises we can plainly understand how spirit exercises its effects on body, and *vice versa* how the body reacts upon the spirit. This is the most significant result of Professor Busse's painstaking investigation. —*a*—

PURE SOCIOLOGY. A Treatise on the Origin and Spontaneous Development of Society. By *Lester F. Ward*. New York: The Macmillan Company. 1903. Pages, xii, 607. Price, $4.00.

Dr. Ward's *Pure Sociology* offers students of this science the first real "system" in any comprehensive sense, that has yet been written. Sociology, the author notes, is still in the analytic stage. The majority of students are still concerned with special inquiries, which taken singly lack perspective, and taken together lack a common basis of valuation or purpose. *Pure Sociology* does effective service in giving to this field a much needed synthetic scheme of social data. Beyond this, the work is a theory of social life, creative and convincing, such as could only have been conceived by a man of great genius and originality.

The author's point of view is strictly evolutionary. On the basis of an historical scrutiny of the course of events, he reaches a theory of the social order as exemplified in the civilised countries of to-day. He makes the subject-matter of sociology "Human Achievement," and sets out with a search for those remoter roots of life from which our complex social processes have grown. He finds the principles which underlie social phenomena the same in essence as those in organic, or even in inorganic, nature. Psychic phenomena are as determinate and predictable as chemical phenomena, when once their nature and relations are known. Hence sociology is a true science, capable of exact treatment; but a scientifically competent knowledge of present-day facts and observances requires a broad sweep back into the sciences from which it is derived.

Dr. Ward's large information in these underlying domains, and his capacity for co-ordination of data, is well seen in the section on "Genesis"—the "Origin and Spontaneous Development of Society." Broad principles are enunciated, such as to contribute substantially to the theory of evolution at large, at the same time that they suggest a monistic explanation of social facts. Among these laws that are to be placed to the credit of Dr. Ward is the theory of "Sympodial Development," which conceives the sequence of evolution as a "sympodial" growth, rather

than as a tapering "tree of life"—currently accepted as a satisfactory representation of the cosmic "becoming." Its advance is a zigzag course, marked by a series of culminating points, whose direction is changed on the appearance of each successive product of development. The factors in this rhythmic march are the same as those found in the growth of sympodial plants—overspecialisation followed by decline and the carrying over and survival of larger vital elements in the derivative stem or offshoot. "Degeneration" thus becomes nothing more than the atrophy of forms absorbed and recreated under new conditions. The sociologist, parallelling the history of organic life, explains the rise and decline of races by this "law of the persistence of the unspecialised." He explains the catastrophic progress of civilisation and its Westward march as a course of successive branchings of social life. The failing peoples do not in reality degenerate, but are merely subordinated to more vigorous types, which are true "anthropologic sympodes," better adapted to survive.

The "filiation," or genetic relation of the sciences suggested above is carried over to the processes of nature and completed by the theory of "Creative Synthesis." This is perhaps the most important single principle enunciated by Dr. Ward. As the name implies, the process of evolution is not simply a sequence of derivation; there is a progressive individual distinction of the resulting products with each successive recompounding of the elements involved. The fact that genesis is in this way a "creative" process not only permits an infinite variety of forms to spring from relatively few elements, or even from an assumed "unitary substratum" of the universe; but it reinforces the essential kinship of social phenomena to the less highly differentiated products of the lower levels of evolution. Dr. Ward makes an interesting application of these laws to the "synthetic creations" that emerge on the psychical stage; as, for instance, "social ideals," which spring from the creative imagination. The "poetic idea" is defined as a "homogeneous undifferentiated truth," a sort of "prophetic type" which embodies the rudiments of many correlated truths that are ultimately brought out in distinct form as individual propositions which mutually reinforce one another. And the "collective mind," or social consciousness becomes under this terminology the "spontaneous creative synthesis" of all individual minds.

The philosophical monism which pervades the thought has a far-reaching effect. It welds the "telic" activities of mankind to the most rudimentary links in the chain of the processes of nature. It posits the biological origin of mind and makes consciousness a property of matter. Mind is a "differential attribute" of the vital processes evolved under the law of creative synthesis, worked out through interaction of less complex elements. This "primordial psychism," in the form of "feeling," first arises as an expedient to the furtherance of the organic functions; but it presently grows into the self-conscious "will" of associated man, and so becomes the fundamental social force. The sequence of synthetic processes, as it is described by Dr. Ward, involves an unremitting conflict between "feeling" and

"function"; yet nowhere does his exposition part from the standpoint of monism with which he sets out. His monism is avowedly loose and broad; it aims to reconcile "infinite diversity with perfect unity," and protests against the narrowness and mysticism into which the great principle has sometimes been compressed and perverted. Within the scope of this ultimate unity, and conditioned by it, there runs throughout the cosmos an all-pervading dualism, a "universal polarity." It is from the equilibration of antithetical forces that eventual organisation comes. This constructive process of equilibration between contending forces Dr. Ward has felicitously named "Synergy." Like the other two laws of evolution advanced by him, this law of synergy applies also to the whole range of the diversified phenomena of life. Indeed, he makes it apply to all constructive change, from cosmic and chemical rearrangement to the spiritual and institutional creations of man. The law of synergy is made to account for the established order of society and to explain the characteristics of all human institutions, religious, domestic, civil, political, and the rest.

The section on Genesis alone affords many further examples of the author's creative insight, but these can neither be detailed nor summarised here. On the other hand, a minor, perhaps superficial, criticism may be in place. It is a matter for regret that the author should have allowed himself so free a use of received teleological phrases and turns of expression in his exposition of genetic sequence. In apology he explains that since the language has taken form under the guidance of teleological habits of thought, the teleological forms of speech are unavoidable, that while of necessity he employs these locutions, he allows them to mean nothing more than the "tendencies of things." But, warning and reservation notwithstanding, recurring expressions concerning the "object" and "end" of nature have their due effect, and are sufficiently disconcerting to any student who is struggling to get away from ingrained teleological prepossessions. It might fairly have been expected that a writer who has shown himself so great a master in the profounder reaches of creative invention and so ingenious an adept in terminological expedients at other points should have found his way to a simpler, more consistent and sincere terminology in this matter that touches the foundation of scientific inquiry.

LAURA MCADOO-TRIGGS.

ZUR EINFÜHRUNG IN DIE PHILOSOPHIE DER GEGENWART. Acht Vorträge von *Alois Riehl*. Leipzig: Verlag von B. G. Teubner. 1903. Pages, 258.

Alois Riehl, at present professor of philosophy in the University of Vienna, and one of the most ingenious coryphæi of German thought, has collected a synopsis of his philosophical views into what might be considered an introduction to philosophy in the form of a series of eight lectures: I. On the Nature and Development of Philosophy; Philosophy in Antiquity. II. The Philosophy of Modern Times; Its Relation to the Exact Sciences. III. Critical Philosophy. IV. The Foundations of Cognition. V. Naturalistic and Philosophical Monism. VI. The

Problem of Life. VII. Schopenhauer and Nietzsche; The Question of Pessimism. VIII. The Present and Future of Philosophy.

Professor Riehl's diction is elegant, and occasionally he carries away his readers with the rhetorical beauty of his sentences, while the thoughts themselves are mature and sound. At the same time he is considerate and shows his appreciation of abnormal phenomena in our philosophical development, especially in his treatment of Schopenhauer and Nietzsche. He by no means endorses the philosopher of the Overman; he is not a follower of Nietzsche, and yet, unlike Nietzsche's antagonists, while pointing out his mistakes delineates his character in a very sympathetic way. He helps us to understand Nietzsche as a phenomenon in the philosophical literature of modern times.

Nietzsche must be understood in contrast to Schopenhauer, for the keynote of Nietzsche's philosophy is the conquest of pessimism. Schopenhauer's pessimism is at bottom hedonistic, a pessimism that despairs of the possibility of enjoyment and must therefore be assumed to be hankering after pleasure. Nietzsche, however, calls out: "The discipline of suffering, of the great suffering, ye know not. This discipline alone has begotten everything that elevates man. Indeed, the standard of valuation consists in how deeply one may suffer."

Nietzsche misunderstood Christianity because he judged it through the conception of Schopenhauer, who interprets it as well as Buddhism as mere negation of life, a negation made for the sake of negation. He knew only the morality of sympathy (*Mitleid*), and did not know that the morality of the Master (*Herrenmoral*) was found before he discovered it. It is easy enough, says Riehl, speaking of Nietzsche's critics, to point out contradictions, and the pathological nature of his philosophy. Further, it is easy to object to Nietzsche's offensive language; but we ought to learn that there are healthy and wholesome elements in Nietzsche's philosophy. We must never lose sight of his intentions and the whole ideal of his mission. The key to his philosophy is contained in the words: "Do not follow me, but follow thyself, thyself alone. Thou must become ever and again he that thou art, the teacher and former of thine own self." Nietzsche felt offended at negativism, and his philosophy aims at the conquest of pessimism. "He condenses," says Riehl, "the spirit of modern times, and by giving it completion he has actually overcome it."

In the same spirit Riehl discusses the epistemological problems and also the questions of natural philosophy, involving the contradictions of materialism and mechanicalism, which have led partly to the theories of energetics as a philosophical principle and partly to the *ignorabimus* of Du Bois Reymond. His own view of philosophy keeps in mind the unity of thought, and while he shows that in classical antiquity philosophy was identical with science, that in the eighteenth century down to our own day philosophy was contrasted with the sciences, yet the future leads back to a unitary conception. "The final result will be that the sciences themselves will be raised to philosophy. Having taken their origin in philosophy,

which was their natural and aboriginal unity, and being differentiated by a division of labor, we shall see them reunited on a higher plane of thought" (page 248).

P. C.

LOGIK DER REINEN ERKENNTNISS. Von *Hermann Cohen*, Professor an der Universität Marburg. Berlin: Bruno Cassirer. 1902. Pages, xvii, 520.

Hermann Cohen is an original thinker, and it is not easy to understand the drift of his argument unless the reader be familiar with the author's previous publications, especially concerning the conception of infinitude. The present volume constitutes the first part of a series which purports to become an entire system of Cohen's philosophy.

In a certain sense Cohen stands aloof from his colleagues. Assuredly he is not at home in modern Germany with its realistic politics and imperialistic ambitions. He mentions with disapprobation the present conditions which are all but unfavorable to a philosophy of ideal aspirations. In spite of this our author clings to his optimism and feels himself at one with the leading thinkers of the past as well as the future. His belief in the final victory of a broad humanitarianism with its ideals of right and justice remains unshaken.

The present volume is entitled *Logic of Pure Cognition*, but it implies the foundation of philosophy. Logic to Cohen is not mere dialectics or a subjective method to be based upon empirical facts or psychological dispositions. Logic is the root of all thought, the objective standard of truth, and the condition of all cognition (pp. 512–513). Philosophy begins with the systematisation of thought, and who can have system without logic! Accordingly, modern associationalism is insufficient (p. 21) and necessarily leads to agnosticism (pp. 514–515), or, what is worse, to a limitation of logic to the subjective sphere of thought, as mere rules of thinking, which would render it possible to re-establish the mediæval principle of two truths. Thus our author takes the ground that there is no metaphysics without logic (p. 517), which leads him further to trace in logic the basis of ethics, æsthetics and psychology. The soul does not establish its nature and the conditions of its being, but discovers them. The data to be found existed before they were established.

It is natural that our author must square himself with the conditions of existence, the prius, or, as Aristotle calls it, *τὸ πρότερον τῇ φύσῃ*, or *πρότερον ἁπλως* (p. 28). Thus Cohen goes in search of the antecedent of being, the *Vor-Sein*, and this feature of his philosophy is perhaps the most difficult part, for he discovers it in the infinite, a non-material condition of reality which suggests the question as to the origin (*Ursprung*).

We appreciate Professor Cohen's earnestness, we agree with his endeavor to establish the objective validity of truth and right, but we are not sure of having understood his meaning as to the repeated proposition of the problem of origin, which occurs in several phases, e. g., as the logic of the origin (pp. 28–34), the

judgment of the origin (pp. 65–77), the thought-law (*Denkgesetz*) of the origin (pp. 103–104), etc. If our author means by origin the eternal formal laws which determine the nature of all being, we do not hesitate to assent to his propositions and will be glad to have our anticipations verified in the subsequent volumes of Cohen's philosophy. At present we confess that his terminology and its application to scientific speculations is not without difficulties, not to say obscurities. Certainly, "origin," i. e., *Ursprung*, should not be understood in the sense of "beginning" (*Anfang*), as our author expressly warns us (p. 65), but in the sense of the Greek term ἀρχή.

Whether or not we will eventually assent to Cohen's views, we must confess that his expositions are thoughtful and suggestive. We have to deal with a genuine philosopher, a man deeply versed both in ancient philosophy and modern speculations, who makes the former bear upon the latter and throws much light upon several problems which are much more ancient than its discoverers imagine them to be;[1] and thus the reader will be richly repaid by a perusal of this *Logic of Pure Cognition*. P. C.

Ueber die Bedeutung des Darwin'schen Selectionsprincips und Probleme der Artbildung. By *Prof. Dr. Ludwig Plate*, Privatdocent an der Universität Berlin. Zweite, vermehrte Auflage, mit zwei Figuren im Text. Leipzig: Verlag von Wilhelm Engelmann. 1903. Pages, iv, 247.

It is now forty-four years since Darwin's epoch-making work on the *Origin of Species* appeared. Not only did it cause a fermentation in the scientific world but also modified our religious views considerably. Since the principle of evolution came to be firmly established, new problems have arisen; and an older representative of the evolution theory, Lamarck, has become the exponent of a solution which seems to be opposed to Darwin. Darwin's special contribution, Darwinism in the narrower sense, is an explanation of evolution through natural selection, and in contrast to it the Lamarckian views emphasise that the development of species is due to use or not-use of organs. Darwin himself was not opposed to the Lamarckian explanation, but in the struggle of parties his name has become the exponent of a school which emphasised the omnipotence of natural selection. The Lamarckians, however, insist on the impotence of natural selection, and claim that the origin of species is due to exercise or function.

Professor Plate's present volume, which is the second edition of a similar book that originally grew from a lecture given by the author some time ago in Hamburg, is a fair exposition of the situation, taking the ground that the present prevailing

[1] We are reluctant to venture into details, but as an instance we will mention only the case of Leibnitz who claims to be the "*auteur du principe*," viz., "*de la loi de la continuité*"; and yet the problem is as old as Parmenides and was discussed and considered by Aristotle, being known to these Greek thinkers as τὸ συνεχές or ἡ συνέχεια.

antagonism to Darwin will soon be overcome and that scientists will after all return to the master and recognise the wisdom of his explanations.

Darwin himself was not as narrow as the Darwinians, and we dare say that Lamarck would not have endorsed the narrowness of the Lamarckians. Both were broader than the schools that are now vigorously fighting each other. Although a confessed disciple of Darwin, our author does not exaggerate the significance of the principle of selection, and he thinks it would be wiser to speak neither of its omnipotence nor its impotence. He is glad to recognise the significance of the Lamarckian factors of evolution, and expects that the true solution can be found only by being fair to both views.

Professor Plate discusses in Chapter I.: (1) The Unessential Objections to Darwinism, mostly views based upon a misunderstanding of Darwin's propositions; (2) Essential Objections (pp. 32–84); this part is naturally more important, and deserves a closer examination than we can give it in the present review. Chapter II. discusses the Forms of the Struggle for Life, and of Selection. Chapter III. is devoted to the Auxiliary Theories of Natural Selection, Darwin's Own Theory of Sexual Selection, and other theories invented for the explanation of secondary sex characteristics; Roux's theory of the struggle of the parts within the organism; panmixia and the explanation of rudimentary organs; Weismann's hypothesis of germinal selection. In Chapter IV. the conditions are discussed which are presupposed for natural selection. The surplus of births, variability, and isolation. Chapter V. treats of the Extent and the Limits of the Darwinian and Lamarckian Factors. This chapter may be regarded as the most original contribution of our author. Having explained the idea of direct and indirect adaptation, he reviews the different methods of accounting for organic adaptation: first, the theological explanation; secondly, the vitalistic explanation; thirdly, the Lamarckian explanation; and finally the Darwinian explanation through natural selection. He criticises Wallace's proposition, that all specific characteristics are useful. Selection, however, is monotypical; it dominates throughout the world of living organisms, but not in the domain of inorganic nature.

The book contains a very useful list of the literature on the subject, and also a good index. —*c.*

ANSICHTEN UND GESPRÄCHE ÜBER DIE INDIVIDUELLE UND SPEZIFISCHE GESTALTUNG IN DER NATUR. Von *Franz Krasan*, Gymnasial-Professor i. r. und k. k. Schulrat in Graz. Leipzig: Verlag von Wilhelm Engelmann. 1903. Pages, 280.

The question has often been raised whether the evolution theory should be taught in school, and men of great authority, among them no lesser authority than the late Professor Virchow, have answered it in the negative. Here we have a schoolman in Austria, Franz Krasan, Professor in the Gymnasium at Graz, with the title of k. k. Schulrat, who presents a series of discussions on the origin of spe-

cies and kindred problems. The book is obviously the product of the author's practical work and proves beyond any doubt how these intricate topics can be ventilated in the classroom before scholars such as attend European gymnasiums. The treatment of the subject, which is mostly in the form of dialogues, may not appeal to the general reader but will certainly prove useful to teachers in colleges and collegiate institutes who cherish the ambition of broaching the problems of nature to their pupils and of awakening in them the spirit of scientific research. *K. K.*

Die Evangelien eines alten Unzialcodex. (B$\aleph$-Text.) Nach einer Abschrift des dreizehnten Jahrhunderts. Herausgegeben von *Alfred Schmidtke.* Leipzig: J. C. Hinrichs'sche Buchhandlung. 1903. Pages, xl, 116. Price, 4 Marks.

The author publishes the Greek text of Mark, Luke, and John after an ancient uncial manuscript in the National Library at Paris. The codex is of the thirteenth century, and has been copied, according to a note, at the request of the Abbess Olympias, whose name henceforth it will bear. This codex Olympias served as a reading book in the church of the martyr Theodorus, and contains, in addition to the text, several personal entries. The probable site of the monastery is Egypt, perhaps Syria. A Frenchman acquired the codex, and it was finally incorporated into the National Library.

A close inspection shows that the manuscript is a careful copy of an older codex, and may therefore become of importance for settling some of the mooted points in variants. Its archetype seems to have been undertaken with the purpose of giving a synopsis of the four Gospels. We have the diatessaron of Ammonius, and Hesychius tried to do the same without letting the contradictions among the different Gospels disappear. Tatian's *Harmony of the Gospels* followed in the same line, and is apparently accomplished in opposition to Ammonius, for Tatian himself especially blames the latter for removing the contradictions, which he regards as intentionally introduced by God.

The present text edition is carefully done, and Schmidtke's work will prove a valuable help to text-critics. —*a*—

A History of Egypt from the End of the Neolithic Period to the Death of Cleopatra VII. B. C. 30.[1] By *E. A. Wallis Budge*, M. A., Litt. D., D. Lit., Keeper of the Egyptian and Assyrian Antiquities in the British Museum. Illustrated. 1902. Price, 8 Vols., $10.00.

Egyptology is making quick progress. The spade unearths new facts almost daily, and since the excavations have been carried on more systematically much

[1] The American publishers are The Oxford University Press, but The Open Court Publishing Company has made arrangements with them to act as agents; accordingly, copies of the work may be obtained by applying directly to us.

light has been shed upon the history of the valley of the Nile, especially the very dawn of its civilisation. Professor Budge, one of the foremost Egyptologists, who has the best means of keeping abreast of the times and incorporating the results of his colleagues' work into his own investigations, here presents us the matured product of the present state of knowledge. The undertaking is gigantic, but he absolves the task to his credit. The contents of the several volumes are as follows: Vol. I., Egypt in the Neolithic and Archæic Period; Vol. II., Egypt Under the Great Pyramid Builders; Vol. III., Egypt Under the Amenemhats and Hyksos; Vol. IV., Egypt and Her Asiatic Empire; Vol. V., Egypt Under Rameses the Great; Vol. VI., Egypt Under the Priest-Kings and Tanites and Nubians; Vol. VII., Egypt Under the Saïtes, Persians, and Ptolemies; Vol. VIII., Egypt Under the Ptolemies and Cleopatra VII. —ς.

ENCYCLOPÆDIA BIBLICA. A Critical Dictionary of the Literary, Political, and Religious History, the Archæology, Geography, and Natural History of the Bible. Edited by The Rev. *T. K. Cheyne*, D.Litt., D.D., Oriel Professor of the Interpretation of Holy Scripture at Oxford and formerly Fellow of Balliol College, Canon of Rochester, and *J. Sutherland Black*, M.A. LL.D., formerly Assistant Editor of the *Encyclopædia Britannica*. Volume IV., Q to Z. New York: The Macmillan Company. London: Adam and Charles Black. 1903. Price, $5.00 net.

The fourth volume of the *Encyclopædia Biblica* now lies before us, containing the letters Q to Z, thus completing the work. We have to repeat that the enterprise is a gigantic one, covering the vast space of the entire Old Testament, to which have been added in this last volume such articles as refer to the development of the New Testament from the Old. For say the editors: "The yearly advancing study of the apocryphal and apocalyptic Jewish literature is destined to have considerable effect within the near future on the treatment of the religious ideas of both parts of our Bible." Accordingly, a few descriptive articles relating to these new subjects can only be favorable to the study of Old Testament theology, and will probably in the not distant future be considered indispensable.

The present volume comes fully up to all the expectations that can be had. It is a stately volume of over 1000 pages, and contains essays of which many might appear in book form and certainly contain more material than can otherwise be found in many volumes. The tone of the expositions may sometimes be considered too conservative by scholars, but this is more excusable of a biblical encyclopædia, which is designed not only for the use of scholars but also for clergymen, and accordingly the partoral side should not entirely be lost sight of.

We may mention especially the care with which the articles on the following topics have been written: Resurrection, Sacrifice, Saul, Sennacherib, the Sermon on the Mount, the Sethites, Shekel, Simon Magus, Simon Peter, Sinai and Horeb, Sodom and Gomorrah, Solomon, Son of God and Son of Man, Spiritual Gifts

Syria, Tabernacle, Temple and Temple Service, Texts and Versions of the Old Testament, Tobit, Trade and Commerce, the Tribes, Wine and Strong Drink, Wisdom Literature and the Book of Wisdom, Zoroastrianism, etc., etc. —ç.

ALBUM-KERN. Opstellen geschreven ter eere van *Dr. H. Kern*. Hem aangeboden door vrienden en leerlingen op zijn zeventigsten verjaardag. Leiden: E. J. Brill. 1903. Pages, xvii, 395.

There is a regulation in Holland according to which all professors retire with full pay at their seventieth year. Professor Kern having attained the age of a septuagenarian now enters upon his well-merited release from work, and in his honor his friends have made this remarkable collection.

It is a unique book, this *Album-Kern*, a volume in large quarto containing collections of several most prominent professors of Sanscrit, Pâli, Chinese, Anglo-Saxon, Dutch literature, etc. It is introduced by a letter to Professor Kern, written by none less than Prof. Otto von Böhtlingk. The most remarkable contribution is the translation of a Sanskrit poem, the gambler's song, one of the seventy songs of the Rigveda, published by Geldner and Kaegi. The manuscript of the translation, which is here reproduced in facsimile, was found among the late Professor Roth's papers and it is probable that it is his own version and versification. Certain it is that it is written from the beginning to the end in the handwriting of the late Professor Roth.

We hope that those contributions of the *Album-Kern* which treat subjects of universal interest will in time be republished in some more accessible form.

The frontispiece is a faithful portrait of Professor Kern. P. C.

THE SURD OF METAPHYSICS. An Inquiry Into the Question: Are There Things-in-Themselves? By *Dr. Paul Carus*. Chicago: The Open Court Publishing Co. London: Kegan Paul, Trench, Trübner & Co., Ltd. 1903. Pages, vi, 233. Price, $1.25.

This book contains a precise outline of the philosophy of the editor of *The Monist*, tested at one of the most critical questions of metaphysics, the doctrine of things-in-themselves. Surd in mathematics is that which is incapable of being expressed in rational numbers, in a word the irrational, and applying the same conception to philosophy, our author investigates the claim made by metaphysicians that there is some irreducible quantity in experience which leads to metaphysicism, agnosticism, or mysticism, finding a classical expression in the doctrine of things-in-themselves. Dr. Carus rejects the assumption of things-in-themselves, quoting one of the Goethe-Schiller Xenions as his motto:

> "Since Metaphysics of late
> without heirs to her fathers was gathered,
> Here at the auctioneer's
> 'things-in-themselves' will be sold."
> —*Xenions* of Schiller and Goethe.

While the philosophy of Dr. Carus is anti-metaphysical, anti-agnostic, and anti-mystical, he warns the reader not to overlook the truth that is contained in the theory of things-in-themselves. He discusses in the first part his own proposition—viz., an elimination of the metaphysical surd from philosophy. He comes to the conclusion that the metaphysical x is not unknown but admits of a solution, leading to the new philosophy, not of nescience but of science (pp. 1–64). In the second part Dr. Carus discusses the views of modern thinkers, commonly known to be progressive but still retaining the residue of a belief in a metaphysical surd (pp. 65–144); and finally in the third part he shows the significance of his solution by applying it to the problem of the soul (pp. 145–226).

Much of the contents of this latest production from the editor's pen has appeared in *The Monist* in the form of essays, but they are here collected and reduced to system so as to exhibit their interconnection and show the scope and method of the author's views. Σ.

FUNDAMENTAL PROBLEMS. The Method of Philosophy as a Systematic Arrangement of Knowledge. By *Dr. Paul Carus*. Third Edition. Chicago: The Open Court Publishing Co. London: Kegan Paul, Trench, Trübner & Co., Ltd. 1903. Pages, xii, 373. Price, $1.50.

This book was out of print for some time, the author being too much engaged in other literary work to revise it for a new edition. In the meantime the publishers were pressed again and again with orders and are now glad to announce its reappearance. The general scope of the third edition is the same as that of the second edition, and our author remains faithful to the original motto of his work, tersely expressed in these sentences:

"Not agnosticism but positive science,
Not mysticism but clear thought,
Neither supernaturalism nor materialism,
But a unitary conception of the world,
Not dogma but religion,
Not creed but faith." Σ.

DIE WELTRÄTHSEL. Von *Ernst Haeckel*, Professor an der Universität Jena. Bonn: Verlag von Emil Strauss. 1903. Pages, 168. Price, 1 M.

Professor Haeckel's *World Riddle*, which was reviewed at length some time ago in our columns, has appeared in a popular edition, in both German and English dress.[1] The enormous success of this book proves not only the versatility of its author, but also the deep interest which the public of the present day take in the popular explanation of religious topics from the standpoint of a scientist.

—ρ—

[1] English publishers, Charles Watts & Co., London.

MR. THOMAS J. McCORMACK.

Mr. Thomas J. McCormark, our assistant editor, has been elected Principal of the La Salle and Peru Township High School, and will enter upon his new duties with the beginning of September next.

Mr. McCormack came to us soon after the completion of his studies. He was educated in Princeton, N. J., where he was graduated in 1884, and took post-graduate courses in Leipzig and Tübingen, Germany, one term at each of these universities (1884–1885). He became connected with The Open Court Publishing Co. in 1888, where his most important work consisted in making translations from the German and French. He rendered into English some most notable essays of the foremost mathematicians, physicists, biologists, physiologists, psychologists, and theologians of Europe, such as Lagrange, Grassmann, Poincaré, Klein, Schubert, Boltzmann, Hering, Wundt, Ribot, Binet, Delbœuf, Topinard, Haeckel, Weismann, Eimer, Carus Sterne, Lasswitz, Cornill, and Delitzsch.

Since 1897 Mr. McCormack has been more closely affiliated with The Open Court Publishing Co. in the capacity of assistant editor.

Mr. McCormack's scientific program is contained in a lecture which he delivered before the Science Club of the Faculty of Northwestern University, Evanston, Ill., and which was published in *The Monist*, Vol. X., No. 4, under the title "On the Nature of Scientific Law and Scientific Explanation."

Mr. McCormack has also edited works by De Morgan, Leibnitz, Hume, Berkeley, and Descartes, and he has written a number of biographies of mathematicians and philosophers which were published with portraits in *The Open Court*. To this last journal and to *The Monist* he likewise contributed a large number of critical notices of current scientific literature and articles on miscellaneous scientific topics.

All the translations of Mr. McCormack are excellent, but his main work is Mach's *Science of Mechanics*, which is especially noteworthy on account of the difficulties of the subject-matter.

In parting we express to Mr. McCormack our thanks for the high grade of work which he accomplished during all these years. Our best wishes accompany him in his new career, and we cherish the confidence that his labors will be attended with success, for he has, in his studies, always kept in mind the theory of education, devoting special attention to the maturest methods of teaching according to the principles of modern science. P. C.

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